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ABSTRACT

This guide introduces teachers to the ideas and methods that underpin project-based learning. Teachers who are new to planning and managing projects will find the guide particularly helpful as a starting point and resource guide. Chapter 1 presents a rationale for project-based instruction, describes potential benefits and concerns, discusses the roles of teachers and students during project work, and describes how projects can help students achieve high standards. Chapter 2 profiles 13 project methods, describes their unique components and features, and presents resources for each project method. These project methods include community study, technology use, environmental investigation, expeditionary learning, field study, the Foxfire approach, microsociety, problem-based learning, service learning, and others. Chapter 3 includes a step-by-step guide for planning and managing projects. In addition to the resources presented in Chapter 2, an annotated list presents 31 selected references on organizing, managing, and assessing student projects. Two appendices present a checklist for designing projects, and project descriptions and comments from actual teachers engaged in project-based learning. The final section presents interdisciplinary resources from the AEL. (TD)

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A Teacher's Guide to Project-Based Learning

Learning through Student Projects

Profiles in Project-Based Learning

Steps for Teachers in Planning and Managing Student Projects

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A Teacher's Guide to Project-Based Learning

by Douglas S. Fleming

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About the Author

Douglas S. Fleming consults with schools and districts in the areas of curriculum development, instructional practice, and learning assessment. He has co-authored several publications for AEL, including *Marginal Learners: Identification, Prevention, and Intervention* and *Focusing on Motivation: The Need to Succeed*.

A Teacher's Guide to Project-Based Learning demonstrates the power of student projects to develop school-community connections, applied research skills, and higher levels of student thinking. Fleming models the practice of inquiry-based teaching and learning in professional development workshops, institutes, and college-level courses throughout the United States.

Introduction

Individual or class projects engage students in in-depth inquiry into areas of interest to the students and important to the course(s) of study. Projects can involve community members and settings and frequently culminate in exhibitions or products for real-world purposes or audiences. They are also a natural and effective way to promote interdisciplinary learning and can be a gateway to teamed instruction.

This book introduces the ideas and methods that underpin project-based learning. Teachers who are new to planning and managing projects will find it a particularly helpful starting point and resource guide.

Chapter 1 presents a rationale for project-based instruction, describes potential benefits and concerns, and discusses the roles of teachers and students during project work. Chapter 2 profiles 13 project methods and describes their unique components and features. Chapter 3 includes a step-by-step guide for planning and managing projects. An annotated resource list and sample project plans complete the book.

Together, these chapters can inform and inspire both veteran and beginning teachers to use student projects as powerful tools for learning in their classrooms.

Douglas S. Fleming
Lunenburg, Massachusetts

Chapter 1
Learning through Student Projects

What is a project?

Projects are intensive experiences that engage students in activities that are interesting to them and important to the course(s) of study. They can involve community members and settings, and they often result in an exhibition or product for a real-world purpose or audience. The typical project lasts for two to eight weeks.

Project ideas can be developed by teachers or students, either individually or in teams. They may also involve community members as resource persons or mentors. Experiences outside the school building allow students to learn about their community and the features that make it unique.

Student choice is an important aspect of project work.

Student choice is an important aspect of project work. Usually, teachers either provide a list of possible topics for students to choose from or have students submit topics for approval. Teachers provide the structure necessary for student success by selecting specific learning goals; requiring students to prepare an outline, design brief, proposal, or analysis before proceeding with the project; and establishing time lines and milestones to guide student efforts.

Six desirable features of project learning are the *authenticity* of the problem and the intended product, *academic rigor, applied learning* that is grounded in the context of life and work beyond school walls, *active exploration* by students, *adult connections* that make adults and their work more visible to students, and *assessment practices* that include the use of clear criteria and

structured self-assessment.[1] These features are more fully described in Appendix A, "The Six A's of Designing Projects."

Students involved in project learning acquire and demonstrate new knowledge through activities such as

- *collections*—thematic or categorical assemblies of items (e.g., insects, rocks, leaves, or photographs)
- *portfolios*—evidence of mastery of a skill or content knowledge
- *designs*—technology inventions or prototype solutions (e.g., a mousetrap-powered vehicle or a better jar opener)
- *research projects*—demonstrations of the ability to design a study; access information via human, print, and technological resources; and communicate findings
- *plans or proposals*—application of logical thinking, research, and time management skills (e.g., a plan for a trip to another country or a business proposal)
- *simulations*—participation in experiences that imitate real-world experiences in a controlled or virtual environment (e.g., mock trial, election, community referendum, city planning, rescue mission)
- *excavations*—discovery of artifacts through archaeological digs
- *construction*—physical execution of a design (e.g., nature trail)
- *service*—use or development of skills and talents through service to others (e.g., peer tutors, homework helpers)
- *audits*—collection and evaluation of primary data (e.g., conducting an energy audit for home or school)

The Six A's of Designing Projects

1. authenticity
2. academic rigor
3. applied learning
4. active exploration
5. adult connections
6. assessment practices

Students may conduct projects in a variety of structures: (1) independently, (2) in small groups or teams within a class, (3) with a whole class, (4) with a whole class working with one or more other classes within the same school, or (5) with a whole class working with one or more other classes from another school.

Students may develop and work on projects in a variety of contexts: (1) entirely outside of class; (2) outside of a regular course, with a mentor or advisor from the community; (3) within a regular course, with teacher or student leader assistance.

Projects offer rich opportunities for helping students make interdisciplinary connections, address academic standards and goals, discover personal talents and interests, develop social skills, and use technology. Within a unit of study, projects help students connect personal interests with course content as they explore a theme in greater depth. Teachers

often assign both project activities and whole-class activities to help students gain a greater perspective on a theme. Figure 1.1 illustrates the relationship among projects, units, themes, and activities. It is possible to use this simple diagram to outline an entire year's course of study.

Student projects are best organized and managed when certain conditions are present.

1. Project work is selected, generated, or organized around student questions and interests.
2. Community resources, issues, problems, or decisions are central to project investigation.
3. The teacher role is that of facilitator, collaborator, and guide.
4. Academic content is tied to state or local curriculum frameworks and learning standards.
5. Project work focuses on student products, performances, and investigations.
6. Project work encourages students to develop products that are creative, intellectually rich, and aesthetically satisfying.
7. Project work is structured around peer teaching, teamwork, and small-group problem solving.
8. Project work requires students to engage in conscious, thoughtful reflection on their own work at key points.
9. Project work integrates up-to-date technologies as tools for locating, accessing, exchanging, managing, and presenting information.
10. Project findings are shared with an audience beyond the teacher and classroom.
11. New projects are generated from questions raised in earlier investigations.
12. Project methods are rigorously evaluated by teachers and students to provide feedback on skill development, content understanding, and attitude change.

Projects offer rich opportunities for helping students

- make interdisciplinary connections
- address academic standards and goals
- discover personal talents and interests
- develop social skills
- use technology

Why are project-based approaches important and legitimate ways of learning?

Project activities can serve students of every academic status by putting learning in a context that gives it meaning. Projects can accommodate different intelligences, learning preferences, or learning styles. Also, providing more variety, choices, and options can increase student motivation as students pursue individual talents or interests. Cognitive psycho-

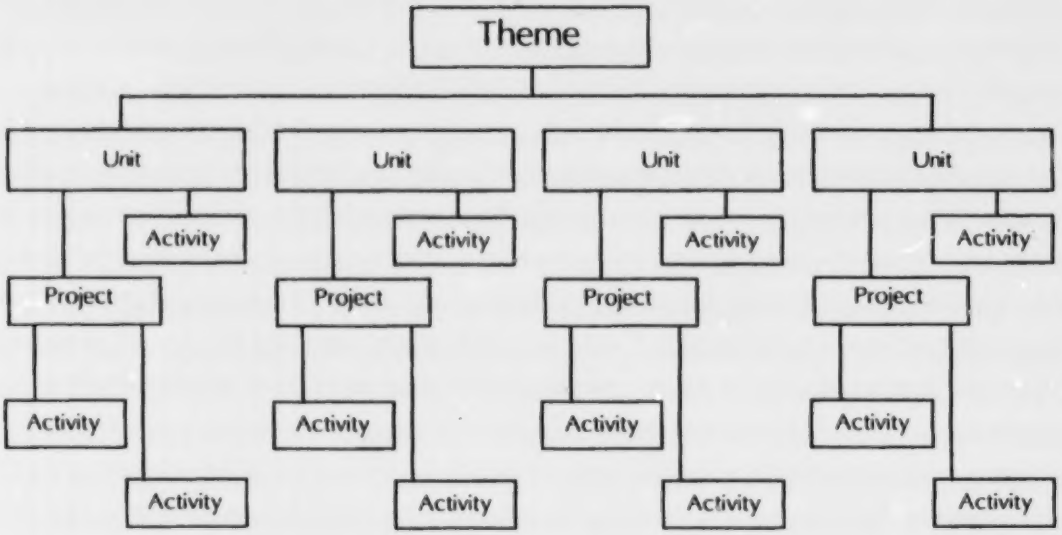

Figure 1.1. The relationship among projects, units, themes, and activities

theme—a conceptual thread that often cuts across several subject areas (example: systems, time)
unit—a purposeful sequence of learning activities articulated by a teacher or defined by a curriculum guide
project—a student's in-depth inquiry into an area of interest to the student and important to the unit of study
activity—shorter task or assignment completed within a unit or project

logical researchers indicate that these factors increase learning. And problem-solving tasks appear to help students store knowledge more easily so that it can be recalled in other situations.[2]

Learning through projects is often associated with the constructivist theory of learning. Psychological constructivism holds that the purpose of education is to help children learn in a way that supports individual needs and interests. Social constructivism emphasizes education for social transformation.[3] Student projects, which are frequently related to both individual and societal concerns, may fall into either or both schools of constructivist thought.

The successful use of projects is facilitated by a learner-centered approach in which teachers serve as guides, monitors, coaches, and facilitators. This approach encourages students to develop habits of mind that can help them become lifelong learners. A learner-centered approach has several characteristics.

- Learners build on their prior knowledge, experiences, and interests.
- Students use primary sources of data whenever possible.
- Problem solving, higher order thinking, and deep understanding of concepts and principles are emphasized.

- Students think about their own thinking, assess their own work, reflect on what they are learning, and set their own goals and objectives.
- Errors and misconceptions are viewed as opportunities for learning.
- Students are encouraged to form multiple perspectives and representations of their learning.
- Multiple forms of assessment are built in and are an ongoing part of learning.

There are other compelling reasons for using project-based approaches. They challenge students to use their minds creatively, independently, and responsibly, which can give them a sense of satisfaction and accomplishment. Projects encourage students to practice working cooperatively and productively with other students, teachers, and community members. They learn to listen, speak, and reach decisions within a team setting that typifies a growing number of work environments. Students also develop other skills that are vital to future academic or workforce pursuits—planning, organization, research, and time management.[4]

As students reflect on what worked well, what didn't, and how they can learn from their experiences, they become better monitors of their own work. Students develop confidence and self-awareness as they use their own strengths to demonstrate learning. Products or performances that result from a project allow teachers to make a more authentic assessment of the learning that has occurred. Students who demonstrate their mastery of content in this way reveal the depth of their understanding rather than simply their ability to recall memorized information.[5]

Project work affords teachers opportunities to encourage the habits of mind that are important in their content areas (e.g., curiosity, flexibility, persistence, responsibility, creativity, and commitment to excellence). But projects also provide a way for teachers to cross disciplinary boundaries and combine learning

Promoting a Sense of Place through Project-Based Learning

Sometimes, traditional "textbook-based" curricula ignore the potential benefits of learning in, about, with, or for the community that the school serves. When textbooks become the sole terrain for exploration, both students and teachers miss opportunities to learn from one another and from the community. Fragmentation of knowledge and loss of meaningful contexts and personal connections can result.

In all communities—no matter how rich or poor, how rural or urban—there are institutions, persons, places, issues, and events that offer opportunities for young people to learn in situations that make learning purposeful and "real" to them. For example, young people can interview community members; investigate and report on local issues; propose solutions to community problems; and visit, consult with, or provide services for community organizations. Project work can help students recognize, appreciate, celebrate, and better understand their local community and its resources.

goals. This type of "bundling" allows teachers to use time effectively while students experience curriculum requirements with less fragmentation and isolation.[6] Projects that connect students to their own interests and talents, to others in the school community, and to the community at large foster active engagement with course content and with real-life tasks and responsibilities.[7]

Summing Up: Benefits of Using Student Projects as an Instructional Strategy

1. increased motivation—students "own the questions" and spend more time working on projects outside of school
2. increased autonomy—students become more responsible and self-directed learners
3. increased achievement—students practice higher levels of thinking through direct application of factual knowledge in making interpretations, conclusions, and critical judgments[8]

Projects that connect students to their own interests and talents, to others in the school community, and to the community at large foster active engagement with course content and with real-life tasks and responsibilities.

What are some common concerns about project-based learning?

Despite their potential benefits, projects can present some concerns for students. Projects often require concentrated effort over an extended period of time; this may be a challenging experience for some. Others may have difficulty choosing a project focus or deciding on the format for a culminating presentation or product. Other student concerns include managing time and materials, working independently, and working with others.

Teachers may also have concerns about project-based learning. Because projects often involve independent, unsupervised study, individual contributions to group efforts may be difficult to assess using traditional methods. Students may be in differing stages of investigation or completion, which makes monitoring more difficult for the teacher. Also, the "results" of project investigations are not uniform or predictable. Teachers embarking on project work may need to learn new roles or skills such as guiding students through questioning, applying new technologies, and collaborating in new ways with others in the school or larger community. The following suggestions address some common concerns.

Content coverage. Let standards, not textbooks, guide instructional decisions. Well-designed projects enable students to

practice and apply several standards simultaneously. Focus on results, not activities.

Teacher planning and preparation. Structure activities and pose questions to guide student investigation. Then support students as they themselves discover and uncover knowledge in pursuit of answers to their own questions.

Student assessment. Teachers might perceive that some students do a great deal of work and others do very little. Unevenness of efforts in project work can be managed by having students do more of the project planning during class time, dividing project work into discrete time segments or phases, conducting more project reporting and debriefing sessions, and requiring certain products (i.e., reflections and generalizations) to be drafted during class time.

How do projects assigned today differ from projects many parents and teachers remember from their own school experiences?

Schoolchildren have been "doing projects" for years, but higher academic standards and new technologies have changed the look and feel of project work in several ways.

Higher order thinking. Yesterday's projects were designed to see if students could find facts. Today's projects require students to interpret raw data, draw conclusions, and apply knowledge.

Teamwork and collaboration. Yesterday's projects were usually completed individually. Today's projects often require teamwork. Some require collaboration across grade levels and subject areas or interaction with mentors, advisors, or partners from the community.

Scope. Yesterday's projects often focused on the past discoveries of others. Today's projects may ask students to investigate a contemporary issue themselves; predict future conditions, events, or relationships; or make interdisciplinary connections.

Technologies. Yesterday's projects culminated in handwrit-

Additional Reading

To learn more about education research that supports project-based learning, consult these resources:

Kathleen Cotton. "Classroom Characteristics and Practices." In *Effective Schooling Practices: A Research Synthesis—1995 Update*. Portland, OR: Northwest Regional Educational Laboratory, 1995.

Harvey Daniels and Marilyn Bizar. "Authentic Experiences." In *Methods That Matter: Six Structures for Best Practice Classrooms*. York, ME: Stenhouse Publishers, 1998.

Carleen Reck. "Including Collaborative Learning Experiences." In *Successful Instructional Practices for Small Schools* (ERIC Digest). Charleston, WV: ERIC Clearinghouse on Rural and Small Schools, 1990. ERIC Document Reproduction Service No. ED 326 352.

ten or typewritten papers, which were sometimes supplemented by posters or three-dimensional models. Today, multimedia presentations may include graphics, digital images, videotaped segments, 3-D animation, and sound. Integration of technology into project work might require teachers to provide direct instruction in how to use these technologies.

Assessment. Yesterday's projects were generally graded by the teacher according to criteria that were not always made explicit ahead of time. More than one person may rate today's projects using criteria or rubrics established jointly by teachers and students.

Information resources. Yesterday's projects consisted primarily of a paper chase; students located information in whatever books, encyclopedias, and magazines were available in the school library. Today's projects require students to synthesize information from these and other sources—interviews with community members and experts, original documents and other primary sources, databases, CD-ROM searches, and the Internet.

Complexity. Projects can still be relatively simple and focused ("collect six newspaper articles and analyze each for issues related to a struggle over power and resources"), but more projects require students to draw on a variety of talents and skills and to interact with resources and persons outside of school.

The role of the teacher often shifts from "content expert" to "supportive coach" while students do project work.

Individualized study. It used to be common for teachers to require all students to complete the same project. Today, teachers more often encourage students to work on individual projects that build on existing strengths while enabling students to stretch and grow in a new area—to practice a skill they cannot perform easily, to learn through a modality or activity that is not "second nature" to them, or to explore a concept or issue about which they have little prior knowledge.

What is the role of the student during project-based learning?

A good project is challenging. It asks students to do more than they think they are capable of doing, to apply knowledge instead of simply consuming it. Students must show what they have learned (content), what they can do (demonstration), and what new skills they have developed.

In project-based learning, the role of the student shifts from "recipient of information" to "maker of meaning." Real-world contexts and problems help students duplicate the approaches,

methods, materials, roles, and language used by professionals. Clear standards and criteria allow students to reflect frequently on their work. Conferences with the teacher, critique sessions, peer review, and class discussions help students make adjustments that will improve the overall quality of their project. In the course of these activities and interactions, students must make many decisions about what is meaningful to them and to their purpose.

Students may assume greater responsibility for locating resources or assuming cooperative team roles (facilitator, timekeeper, reporter, or recorder). Students can help plan, organize, support, or carry out activities such as presentations, discussions, case studies, role-playing, interviews, survey construction and administration, laboratory exercises, field trips, guest speaker events, and analysis of videotaped segments.

Students often present the final product, performance, exhibition, or demonstration to an audience outside the school. This audience may assist in the final evaluation, along with the teacher, the student, and with other students. Students may be assessed on a variety of learning dimensions in addition to their knowledge and understanding of the material (e.g., skills, work habits, and problem-solving techniques).

Supporting Students Who Might Become Discouraged

Learning through student projects departs from traditional classroom practices in significant ways. Teachers may need to use strategies that support students who might otherwise become discouraged.

1. Orient students to the overall time lines and phases of project investigation.
2. Develop monitoring and scaffolding tools to help students keep on task and on time. Production of project plans, proposals, report drafts, and preliminary conclusions helps students stay focused. By helping students "chunk" a complex project into a series of manageable steps with accompanying products, teachers help students successfully complete long-term assignments.
3. Conference with individuals and research teams on a regular basis. This helps teachers identify students who are in danger of falling behind. Also helpful are brief "check-ins" or class meetings to review progress.
4. Develop clear and understandable rubrics that let students know how their performance will be rated. Scoring guides can be developed for each phase of a research project.

What is the role of the teacher during project-based activities?

It is easy to think that everything that is learned has to be taught—that is, presented or mediated by the teacher. The assumption underlying this belief is that perfect transmission of information results in perfect reception of knowledge and understanding. Project learning, on the other hand, recognizes that students can learn while following an investigative or creative process.

The role of the teacher often shifts from "content expert" to "supportive coach" while students do project work. There is less emphasis on teacher presentation and more on providing support and structure. Generally, teacher-coaches invite and use open-ended questions; foster reflective discussion; respect and value diversity in learners and their questions; enable multiple representations of ideas, questions, and conclusions; model the tools of inquiry and investigation; seed student inquiry with powerful ideas and frameworks; and build assessment into the learning process. The following are examples of the types of things teachers might do to support project learning.

- Plan a series of teaching and learning activities, including direct instruction, to prepare students to meet project requirements.
- Investigate and locate a range of resources essential to the project. Arrange for their availability with the media center or library at the school and in the community.
- Help students define problems or questions and construct plans to accomplish objectives within time constraints.
- Model, give feedback, and provide scaffolding (tools, forms, guidelines). Then be available for consultation as student learning progresses.
- Maintain flexible working environments so that everyone is working, but not necessarily on the same thing.
- In conferences with individuals and groups, probe and challenge student thinking.
- Keep the process moving by managing group dynamics and by monitoring and adjusting the level of difficulty or challenge in the project assignment.

Teacher presentations, teacher-led recitations, and teacher-administered tests and quizzes are the norm in many classrooms. But in project-based learning, students generate their own questions, forms of inquiry, and knowledge. Students determine how to express and display their learning. These concepts are at the heart of project work. Putting these concepts into action may require adjustments on the part of the teacher.

This is especially true in cases where teachers weren't taught through projects themselves and have not been prepared through professional development opportunities to lead or evaluate project learning. These teachers may not have given serious consideration to using projects as learning tools. Also, teachers may have some apprehension about project learning ("I'm not sure I can control

it," "It will take too much time," "It will be hard for students to make up work if they miss a class," "It's not easy to grade," "My students can't handle that much responsibility," "My community expects me to impart my knowledge," "My students don't like it"). Teachers may be unfamiliar with using questions to guide learning—a cornerstone of project work. Or the district teacher evaluation instrument may define the responsibility of teachers too narrowly. The prevailing culture of teaching also affects how readily teachers assimilate project work into their repertoire. Are students empty vessels to be filled or candles to be lit? How the teachers within a school or community answer this question affects their willingness to adopt project-based learning approaches.

Projects can "kill two standards with one stone."

Schools and districts that rise to the challenge of aligning curriculums, lesson plans, and tests to meet national and state standards face yet another challenge. The Mid-continent Regional Educational Laboratory (McREL) study of evolving standards indicates there is a mismatch between the amount of content to be covered and the amount of instructional time available. In fact, McREL determined that "to adequately address the content identified in the national- and state-level standards documents, . . .[K-12 education] would have to be extended from kindergarten to grade 21."[9] Projects, which usually cut across the boundaries of many disciplines, are a natural way to design learning experiences that "kill two standards with one stone."

How can projects help students to achieve high standards?

Many states have endorsed new standards for student performance in various subject areas. These standards often include new definitions of what it means to have a good program in mathematics, science, technology, language arts, health, social studies, health, world languages, or music and the arts.

While new standards articulate high expectations for what American students should know and be able to do, the standards themselves are not intended to *be* the curriculum. The curriculum is what teachers do with students to help them achieve the standards. The new standards are intended to promote better ways of teaching and learning and to encourage local curriculum development and meaningful student assessment practices.

State departments of education are implementing statewide assessments that align with the new approved subject area standards. Important tasks for teachers and administrators are to compare state standards to local curriculum components, identify performance indicators that can be used to track student progress, and create assessment tasks that gather evidence of student progress toward meeting standards.

A challenging part of standards-based reform is to reach agreement on what the new standards require of students and to explore what teachers can do differently to help students achieve the new standards. Many of the new standards emphasize higher levels of student thinking that go well beyond simply recalling information; students must demonstrate that they can analyze, organize, and evaluate information. The language accompanying new standards calls for students to be more actively engaged in the learning process. Some of the ways students can be more actively involved in their own learning include classroom opportunities to

- teach and explain concepts and processes to each other
- summarize and present evidence and proof
- study a situation from different perspectives
- find shared characteristics in solving diverse problems
- assess their own performance to identify what they are doing well and what they need to improve upon
- critically evaluate information in order to resolve conflicts and dilemmas

Student projects can provide the structure needed to translate higher standards into everyday classroom practice.

Student projects can provide the structure needed to translate higher standards into everyday classroom practice. Interdisciplinary units and projects can be built around tasks that require students to solve problems, communicate, reason, and make connections. Block-of-time scheduling, experiential learning, technology-based research, and other related approaches are being used by some schools and districts as a means of reaching higher standards in learning.

Notes

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Chapter 2
Profiles in Project-Based Learning

This chapter profiles 13 different project-based learning approaches that lend themselves to interdisciplinary instruction. Teachers who decide to develop a project based on one of these approaches should keep in mind the three characteristics of effective projects.

1. **A clear purpose or goal.** The teacher knows what skills and academic standards students will accomplish based on the project's design and focus of inquiry. The student knows what result he or she is working toward and the criteria by which it will be judged.

2. **Relevant context.** Students pursue their purpose through active exploration that involves people, settings, materials, and information that are meaningful to them. Student-generated interests, ideas, questions, or needs are considered in the project's design. Students apply learning as they confront real-world dilemmas: Problem situations are sometimes ill-defined, complex, and messy. New information or new perspectives must be considered as they emerge. A study may result in a variety of answers rather than "the one correct answer."

3. **Demonstration of learning through performances or products.** Students represent their learning through multimedia presentations, print materials, performances, models, simulations, or other means (e.g., videotapes, brochures, plays or skits, recitals, musical scores, computer-assisted presentations). The audience for these performances or products may include other students, parents, and community members.

Two elements are common to all the profiles presented here.

- **Collaborative inquiry.** Teachers, students, and other adults (researchers, state or local authorities, community members) all contribute important perspectives during the inquiry.
- **Coaching from the teacher.** The role of the teacher in project work is not just to "dispense" information, to "cover" the curriculum, or to be the final "judge" of a project's worth, but to become a co-investigator with students, a thinking coach, and a facilitator of discussion and questioning.

The purpose and focus of a project determines the degree to which the following elements will be present:

- incorporation of or emphasis on using current **technologies as tools** for locating, organizing, analyzing, or displaying information
- involvement of students in **activities outside the classroom**
- **team planning** by two or more teachers working together
- **involvement of students in raising questions** or choosing the direction of an inquiry
- opportunities for students to make **individual or small-group choices** and decisions
- opportunities for students to learn the skills and habits of **productive teamwork**
- connection to **family or community resources**
- reporting of learnings to an **audience beyond the school** and classroom
- **learning partnerships, apprenticeships, or mentorships** with another student, teacher, or adult from the community
- assignment of **specific roles** within learning teams or as actors in simulated decision-making structures
- **collecting, organizing, interpreting, or reporting data** collected during a systematic study

The role of the teacher in project work is not just to "dispense" information, to "cover" the curriculum, or to be the final "judge" of a project's worth, but to become a co-investigator with students, a thinking coach, and a facilitator of discussion and questioning.

Profile No. 1: Community Study

A community study provides students an opportunity to learn in and about their community while applying knowledge and skills they have learned in school. In a community study project, students might explore community issues; raise questions; interview citizens, authorities, or other students; record and transcribe oral histories; correspond through letters or e-mail; collect and interpret data; develop a community profile; visit community sites;

and evaluate the community study itself. Throughout the project, students take on authentic investigative and reporting roles as they prepare plans, questions, interviews, letters, stories, reflections, summaries, notes, and recommendations. As they learn about their communities, students learn about themselves.

Example—*Senior Biography*

Selected fifth graders from two elementary schools in Albemarle County, Virginia, corresponded by e-mail with selected members of the local senior citizens center. Through electronic interviews, the students created biography home pages featuring their senior partners. While practicing writing skills for an authentic purpose and audience, the children learned about historical events through firsthand perspectives. The technology components of the project helped the students to increase their technological literacy in a meaningful context. The Web pages the students created can be viewed at http://www.runet.edu/~jacohen/srproj/srbioprj.htm.

As they learn about their communities, students learn about themselves.

Print and Media Resources

Carter, C. *UnCommon Knowledge: Hands-on Science Projects*. Charleston, WV: ERIC Clearinghouse on Rural Education and Small Schools, 2000. http://www.ael.org/eric/ (15 May 2000).

Gillis, C. *The Community as Classroom: Integrating School and Community through Language Arts*. Portsmouth, NH: Boynton/Cook, 1992.

Schwartz, J. "Using an Electronic Network to Play the Scales of Discourse." *English Journal* 79: 16-24 (1990).

Stevenson, C., and J. F. Carr, eds. *Integrated Studies in the Middle Grades: Dancing Through Walls*. New York: Teachers College Press, 1993.

Wresch, W., ed. *The English Classroom in the Computer Age: Thirty Lesson Plans*. Urbana, IL: National Council of Teachers of English, 1991.

Web Sites

Albion Public Schools, Nebraska
http://albion.esu7.org./S@C/index.html
Community study projects

Civic Practices Network
http://www.cpn.org
Case studies and essays on civic renewal

Office of Academic Affairs at Portland State University
http://www.oaa.pdx.edu/CAE/FacultyFocus/spring96/dilafruz.html
"Reflection in Community-Based Learning Courses: Learning From Our Analysis of Our Teaching," by Dilafruz Williams and Amy Driscoll

Kodak
http://www.kodak.com/cluster/global/en/consumer/education/lesson Plans/lessonPlan020.shtml
"Community Study through Photographs," by Diane J. Tallman (grades 1-3)

U.S. Department of Education
http://www.ed.gov/databases/ERIC_Digests/ed363568.html
"Teaching With Historic Places" by Kathleen Hunter

School of Education at Indiana University-Bloomington
http://education.indiana.edu/cas/tt/v2il/community.html
"Community Based Learning/The Lake Neshonoc Project," by Mary Baumann (grade 6)

Profile No. 2: Design and Technology Experience

Design and technology experiences challenge students to apply their learning to a situation or problem by developing a prototype or working model. This requires that students use critical thinking, analysis, group decision making, and evaluation skills. The results are tangible products whose performance can be measured in some way. Students make or use tools that help them work with and transform materials to new uses. Design challenges can draw from a variety of disciplines, including art, architecture, business, science, mathematics, history, and music. The sequence below describes the steps in a design process.

Students make or use tools that help them work with and transform materials to new uses.

1. Analyze the situation. What is the essence of the situation we are trying to address?
2. Prepare a written brief. Outline the problem to be solved.
3. Research the topic. What new information and knowledge might help us?
4. State the specifications. What are the limits here? What will influence the final solution?
5. Work out multiple solutions. Suggest several possible designs. Sketch or outline these on paper.

6. Choose a preferred solution. Time, materials, cost, and available skills may influence your choice.
7. Prepare working drawings. Illustrate the solution from several perspectives. Show details of construction.
8. Build a prototype. Build a model first—from paper, wood, cardboard, or Styrofoam—then construct a working model.
9. Test and evaluate your design. How well does it function? Is it safe to use? Does it perform reliably? Were the materials used the best choice? How could you now improve on your design?
10. Report your findings. Communicate your design features, rationales, and results.

Example—*The Paper Yacht Regatta*

Students in grades three and four compete in a paper yacht regatta. They are challenged to design and build a paper boat that will sail using wind for power and carry a "crew" of four 50-gram weights. As students experiment with different types of materials, they learn about characteristics that make some materials more suitable for a particular use than others. They generate designs and give reasons for their selection of materials. Students must assemble and test their craft demonstrating minimal waste of materials and safe use of tools.

Source: Dale Hendrick, Drouin Primary School, P. O. Box 172, Drouin, Victoria 3818 Australia
Drouin Primary School
http://members.dcsi.net.au/drouinps/tecacts.html

Print and Media Resources

Davis, M., P. Hawley, B. McMullan, and G. Spilka. *Design as a Catalyst for Learning*. Alexandria, VA: Association for Supervision and Curriculum Development, 1997.

Johnsey, R. *Design and Technology through Problem Solving*. London, England: Simon and Schuster, 1990.

Raizen, S., P. Sellwood, R. Todd, and M. Vickers. *Technology Education in the Classroom: Understanding the Designed World*. San Francisco: Jossey-Bass, 1995.

Web Sites

University of Texas-Manufacturing and Design Research Laboratory
http://shimano.me.utexas.edu/DTEACH.html
The Design Technology and Engineering for America's Children Teacher Education Project, a grassroots science-mathematics-technology teacher education project for elementary school educators

Ball State University-Computer Science Department
http://www.cs.bsu.edu/homepages/kirkwood/briefs.htm
Technology Education Design Briefs for the Elementary Grades, problem-solving activities that have been tested with children

Institute for Advanced Technology in the Humanities at the University of Virginia
http://jefferson.village.virginia.edu/~meg3c/id/id_home.html
An introduction to teaching invention and design; includes an index of learning modules and resources

The College of New Jersey
http://www.tcnj.edu/~ties/index.html
TIES Magazine supports technology education and the integration of math, science, and technology curricula

Profile No. 3: Environmental Investigation

Active investigation on the part of teachers and students requires combining skills and content from several subject areas.

Environmental investigations stress the importance of systematic data collection and analysis to learn more about conditions, processes, populations, and life cycles of organisms. Whatever the focus of the project, students collect, organize, graph, and interpret data in an engaging, real-world context. The teacher and the class define an initial question, choose methods of investigation, and select ways to organize, interpret, and report the collected information. Through small-group planning sessions and discussions, tasks are divided, roles assigned, and accurate sampling techniques carried out. Active investigation on the part of teachers and students requires combining skills and content from several subject areas. Students might simultaneously learn and apply knowledge in the fields of science, mathematics, technology, policy and legislation, and economics. Teachers may use multiple assessments to gauge student progress in the areas of communicating, reasoning, and problem solving. The data collected as part of a class environmental investigation may be kept by the school or

shared on-line with researchers, exchanged with other schools collecting similar data sets, or possibly incorporated into an existing database that provides information for students and researchers worldwide.

Example—*Community Earth Summit*

High school students in Santa Rosa, California, prepared for the Community Earth Summit by first choosing partners. Partners reviewed both print and on-line background materials, then chose an issue to investigate. They explored the Fulton Valley Prep Web site for their topic and general area (i.e., ozone and air quality), looking for scientific explanations, quotes from authorities, charts and graphs, and global and local connections. They met in caucuses to discuss the issues, review research, and share resources. They continued to research public or private policies and practices through interviews with local experts, surveys, attendance at meetings, and so forth. At a second caucus, students shared what they had learned about interests, policies, and practices and brainstormed possible actions that could make an impact on the environment.

To demonstrate their learnings, students presented findings to their caucus. Presentations included the following features:

- an explanation of the issue and why it matters, both locally and globally
- graphs and charts to provide factual support
- objective descriptions of the interests in this issue
- a statement of students' personal stand on the issue, with persuasive support
- recommendations for possible actions that might be submitted to the Community Summit, along with well-reasoned support for the recommendation

Each caucus then presented a recommendation for action to the Community Summit.

Students discussed and eventually adopted some of the actions to carry out.

Source: Kathy Juarez, Fulton Valley Prep at Piner High School, 1700 Fulton Road, Santa Rosa, CA 95403; 707-528-5245; kjuarez@metro.net

Print and Media Resources

Elder, J., ed. *Stories in the Land: A Place-Based Environmental Education Anthology.* Great Barrington, MA: The Orion Society, 1998.

Knapp, C. E. *Just Beyond the Classroom: Community Adventures for Interdisciplinary Learning.* Charleston, WV: AEL, 1996.

Other Resources

ASCD Environmental Education Network
Margaret Paterson
Environmental Education Coordinator
Tacoma Public Schools
601 S. 8th St.
Tacoma, WA 985405
253-596-1274
253-596-1203 (fax)

ASCD Environmental Education Network
Margaret Tudor
Washington State Department of Wildlife
600 Capitol Way North
Olympia, WA 98504
360-902-2157 (fax)

Web Sites

Simmons College-Boston
http://earth.simmons.edu/monitoring_projects/index.html
EnviroNet Monitoring Projects for 1998-99, including Acid Rain, BatNet Project, BirdWatch, CoyoteHowl, InsectWorld, Ozone, Plants, RoadKill '98, SaltTrack, VernalPools, Watershed, and WhaleNet

Institute for Global Communications—Global Rivers Environmental Education Network
http://www.igc.apc.org/green
Interdisciplinary resource that involves students around the world in studying and sharing information on water quality and watershed sustainability

Global Learning and Observations to Benefit the Environment
http://www.globe.gov
A worldwide network of students, teachers, and scientists who are collecting data to study and understand the global environment

TEAMS Distance Learning Projects
http://teams.lacoe.edu/
Links to TEAMS Distance Learning Projects of the Los Angeles County Office of Education and other organizations, providing opportunities for students to engage in collaborative activities that extend and enhance student learning

Earth Force
http://www.earthforce.org
Earth Force, dedicated to helping young people develop active citizenship and environmental stewardship

Southern Illinois University-College of Science
http://www.science.siu.edu/long-term/methods.htm
A methods manual describing the collection, entry, and archiving of data

Profile No. 4: Expeditionary Learning

Learning expeditions are purposeful, rigorous, in-depth studies of a single theme or topic. They involve challenge, teamwork, and learning by doing. Usually interdisciplinary, expeditions often revolve around projects and performances that take students outside the school and bring the community inside the school. There is an emphasis on family and community involvement. Equal value is placed on intellectual and character development. Students keep portfolios of their work. Journal writing provides time for silence and reflection throughout the program. Expeditionary learning designs may require deep and focused instruction, flexible block-of-time scheduling, heterogeneous grouping, and teaching assignments that keep teachers with the same students for two years.

The curriculum of an expedition is organized around real-life challenges, with fieldwork comprising about one-quarter of students' time. Expeditions may last three to nine weeks. As they design an expedition, teachers ask defining questions.

1. What products or demonstrations of knowledge will students work on?
2. What knowledge and skills will they need in order to perform well?
3. What criteria will be used to evaluate the quality of student work?
4. How will each person stretch his or her own personal limits?
5. How will we introduce the challenge or "kick off" the expedition?

Usually interdisciplinary, expeditions often revolve around projects and performances that take students outside the school and bring the community inside the school.

6. What firsthand experiences will students have during the expedition?
7. How will family members be involved in planning, implementing, or assessing the expedition?
8. What opportunities for service, solitude, and reflection are embedded in the expedition?
9. What culminating activities and celebrations will bring closure to the expedition?
10. What learning resources will be needed to support the expedition?

Example—*Water: A Whole-School Expedition*

Ron Berger involves his entire elementary school and its surrounding community in a yearlong interdisciplinary expedition. Students from kindergarten through sixth grade study water as a resource, along with its physical properties and biology. Aesthetic dimensions of water, through literature, music, poetry, and painting, provide a common thread that runs through student investigations. To help them with their research, students draw upon the talents and interests of town residents, local experts, and a college professor and his class. As a culminating study, students test the town's drinking water for lead and sodium contamination.

Source: Ron Berger, Shutesbury Elementary School, 23 West Pelham Road, Shutesbury, MA 01072; 413-259-1212.

Print and Media Resources

Cousins, E., and M. Rodgers, eds. *Fieldwork: An Expeditionary Learning Outward Bound Reader*. Vol. 1. Kendall/Hunt: Dubuque, IA, 1995.

Herdman, P. "When the Wilderness Becomes a Classroom." *Educational Leadership* 54(3): 15-19 (1994).

Rugen, L., and S. Hartl. "The Lessons of Learning Expeditions." *Educational Leadership* 54(3): 20-23 (1994).

Springer, M. *Watershed: A Successful Voyage into Integrative Learning*. Columbus, OH: National Middle School Association, 1994.

Web Sites

Expeditionary Learning Outward Bound
http://www.elob.org/
A description of the design principles and core practices of Expeditionary Learning Outbound Bound

Education Week
http://www.edweek.org/ew/vol-14/10exper.h14
Adventures in Learning, by Joanna Richardson, Dubuque Iowa

New American Schools
http://www.naschools.org/schools_results.html
Working Towards Excellence: Early Indicators from Schools Implementing New American Schools Designs

Association for Experiential Education
http://www.aee.org/
The Association for Experiential Education, an international organization promoting learning through direct experience, supports individuals and organizations in the areas of outdoor education, recreation, adventure programs, youth services, mental health, leadership training, and environmental education

U.S. Department of Education
http://www.ed.gov/databases/ERIC_Digests/ed345929.html
Changing Schools through Experiential Education, by Peggy Walker Stevens and Anthony Richards; description of how experiential education can help make curriculum more challenging and significant for students

Northwest Regional Educational Laboratory
http://www.nwrel.org/scpd/natspec/catalog/eloutbound.htm
A description of key elements of Expeditionary Learning Outward Bound (K-12)

Montgomery County Public Schools-Rockville, MD
http://www.mcps.k12.md.us/curriculum/socialstd/FT/Field_Trip_start.html
Tips for elementary school teachers to make field trips more productive learning experiences

Memphis, TN
http://www.memphis-schools.k12.tn.us/schools/middlecollege.hs/middle.html
Middle College High School's expeditionary learning approach to preparing their students for the 21st century

The Odyssey School
http://www.odysseydenver.org/Ref/expframe.htm
Odyssey School, a charter school in Denver, Colorado, that incorporates a project-centered, experiential approach to learning and uses a "Work Sampling System" to evaluate student progress

Profile No. 5: Field Study

Field studies address a question, problem, or issue outside of the classroom and are conducted by teams of students under the supervision of a faculty member. A traditional view of fieldwork is that it occurs in natural surroundings (coastal areas, rivers, marshes, mountains, oceans, islands, forests, lakes, or farms) or historic and cultural sites, but more recent field studies have focused on conditions in banks, city councils, retail stores, hospitals, day-care programs, medical clinics, and other community institutions. Important components of a field study include (1) an authentic question to be resolved thorough data collection and analysis, and (2) a presentation of findings and recommendations to an audience beyond the classroom. Students often work with a liaison from a community agency or business.

Field studies require students to identify a problem, break it down into its parts, determine the issues to be addressed, identify the data needed, construct interview guides, conduct face-to-face interviews, analyze data, organize and display findings, draw conclusions, make recommendations, and prepare and present written and oral reports.

Field studies introduce authentic tasks and concrete investigative experiences into the curriculum. They are more than field trips—although learning how to learn in out-of-school environments (ponds, fields, and grocery stores) and informal education settings (museums, parks, aquariums) may be important staging activities to motivate, stimulate, and prepare students for their roles in a study team investigation. They are also more than just "study abroad" or "study afield" programs—although both field studies and study abroad programs have the potential to reinforce classroom learning, develop a sense of teamwork and community, enhance personal growth, and ingrain respect for nature and diversity.

Field studies introduce authentic tasks and concrete investigative experiences into the curriculum.

Pre- and post-visit activities help make field visits more meaningful to students. For example, before taking her class on a field trip to Chesapeake Bay, teacher Rose Furr taught about the animals and fossils found in the bay and asked her students to predict what they would discover there. After the trip, she asked them to prepare four different types of writing products:

- a persuasive piece convincing other people to visit the bay
- a narrative describing what they did and saw during their trip
- an expressive piece conveying their feelings about the bay
- an informational piece explaining the historical importance of the bay

Example—Market Survey

A health care provider wanted to conduct a market survey to determine the need for a new medical clinic. A team of high school students designed a survey of medical and nonmedical services and reported their findings, conclusions, and recommendations to the local provider. In order to ensure the safety of the student team, individuals interviewed were limited to parents of children in the local school district.

Source: C. C. Jett and J. C. McKee. *Field Studies: Challenging School-to-Work Projects.* Wheaton, IL: Critical Skills Group Ltd., 1992.

Pre- and post-visit activities help make field visits more meaningful to students.

Print and Media Resources

Jett, C. C., and J. C. McKee. *Field Studies: Challenging School-to-Work Projects.* Wheaton, IL: Critical Skills Group Ltd., 1992. Available from Critical Skills Group, $30, 630-682-5388.

Willis, S. "Field Studies—Learning Thrives Beyond the Classroom." *ASCD Curriculum Update,* 1-2, 6-8. Alexandria VA: Association for Supervision and Curriculum Development, Winter 1997.

Web Sites

Campus Net
http://www.eideti.com/educat/fieldst/
Education organization dedicated to environmental studies

Profile No. 6: The Foxfire Approach

The Foxfire program began in 1966 when Eliot Wigginton went to Appalachian Georgia to teach high school English. Because the students were not responding to his best efforts to teach basic English skills, Wigginton suggested that his students create a literary magazine. They struck on the idea of a magazine telling the stories of community elders—their aunts, uncles, and grandparents. They named their publication *Foxfire.* For more than 30 years, the Foxfire organization has been known for its innovative approach to improving educational practice.

The Foxfire approach provides a framework for developing active, collaborative, learner-centered environments. A key feature of this approach is community investigation undertaken by students—frequently involving tape recorders, cameras, field trips, in-class interviews, descriptions of places, and project work.

Eleven principles guide the work of teachers and students in Foxfire programs and govern the relationship among teachers, learners, and the curriculum.

1. Learner choice, design, and revision is central to project work.
2. The teacher's role is that of facilitator and collaborator.
3. Skills and learning expectations are identified ahead of time.
4. Learning is active; students pose and solve problems, develop understanding, and produce products.
5. Peer teaching, small-group work, and teamwork occur regularly.
6. Learners connect course content to the community in which they live.
7. There is an audience beyond the teacher for learner work.
8. New activities spiral out from completed activities.
9. Imagination and creativity are encouraged.
10. Reflection takes place at key points throughout the work.
11. The work is subject to rigorous and ongoing assessment.

The Foxfire approach provides a framework for developing active, collaborative, learner-centered environments.

The Foxfire approach draws on students' interests; recognizes the local community as a resource and an audience; and builds on student action, imagination, and reflection. The teacher is "a facilitator, not a boss." Teachers guide students but let them make decisions.

Example—*A Community Magazine*

Laretta Scott, an English teacher at Salem High School in Conyers, Georgia, applied the Foxfire approach when students decided to publish a community magazine. Students interviewed local citizens, including a centenarian and a mortician. The community magazine concept led to the formation of an advisory board, development of a job application process, selection of editors from among classmates, visits to printing presses, and use of budgeting skills.

Source: Laretta Scott, Salem High School, 3551 Underwood Road, Conyers, GA 30208; 404-929-0176

Print and Media Resources

National Education Association. The Foxfire Approach. TeacherTV Episode No. 9. *Whole Child, Whole Village* (videotape). Washington, DC: NEA, 1992. Illustrates work based on student interest; learning from past experiences; recognizing the community as an audience; and using student action, creativity,

and reflection. Features Lavetta Scott, an English teacher at Salem High School in Conyers, Georgia, and students who decided to publish a community magazine.

Wigginton, E. *Sometimes a Shining Moment: The Foxfire Experience*. New York: Anchor Press/Doubleday, 1986.

Web Sites

Foxfire
http://www.foxfire.org/
The Foxfire Fund's home page; includes mission statement, teaching approach, core practices, programs for teachers, and more

Asheville City Schools, North Carolina
http://www.asheville.k12.nc.us/Dickson/dickson.htm
Isaac Dickson Elementary School, which uses the Foxfire Approach

Profile No. 7: Microsociety

A microsociety is a miniature community created and run by students within a school. A microsociety could involve students from various grade levels, or just one class or grade level, in overseeing a business or cultural institution, court and legislature, or all of these. Students gradually become immersed in the realities of a free market economy—taxes, property concerns, technology, environment, government, and employment. Through this interactive approach, students come to understand the political, moral, and socioeconomic forces influencing a society. The microsociety is a learning environment that enriches reading, writing, and mathematics skills and prepares students for life beyond the classroom. Students have a chance to own a business, be a lawyer, earn a paycheck, travel to exciting places, create laws, buy and sell real estate, work as a reporter for a newspaper, open up a bank account, and more.

The microsociety is a learning environment that enriches reading, writing, and mathematics skills and prepares students for life beyond the classroom.

Example—*Willow Oaks Microsociety*

Students at Willow Oaks Elementary School became bankers, politicians, and small business owners through a microsociety project. They ran a new postal system, a judicial system, and a communications system. The K-4 school was divided into neighborhoods and communities. Students devised a judicial system in

which they determined the consequences for infractions of microsociety rules. They operated their own businesses—applying for small business licenses and developing pricing and marketing plans. On "market days," students went from class to class to sell products to one another. One classroom was transformed into a "global community room" to house the school's city hall, citizen's court, bank, marketing center, publishing center, media center, and post office.

Source: K. Khorge, "Willow Oaks to Mirror Society." *The Palo Alto Weekly* (1995, August 16) http://www.paweekly.com/PAW/morgue/news1995_Aug_16. MICROSOC.html (15 May 2000).

Print and Media Resources

Fletcher, K. D. *The Mini-society Workbook: Everything You Need to Create a Mini-society in Your Classroom*. Englewood, CO: Teacher Ideas Press, 1996.

MacNeil/Lehrer Productions and WETA-TV. *Learning in America: Schools That Work*. Washington, DC: WETA, 1990. Features the Lowell, Massachusetts, Microsociety School. ISBN 0-7936-0187-8. Order from PBS Video, 1320 Braddock Place, Alexandria, VA 22314-1698

National Education Association. Enterprise Village, TeacherTV Episode No. 6, *Business and Education*. Washington, DC: NEA, 1993. Illustrates a simulated business community for Pinellas County schools created with support from many area businesses. Fifth graders staff the retail stores, handle the bookkeeping, run the various businesses, and even approve bank loans. Students run the businesses and purchase goods and services with specially created checks and ledgers.

Richmond, G. "The Future School: Is Lowell Pointing Us Toward a Revolution in Education?" *Phi Delta Kappan* 71 (3), 232-236 (November 1989).

Web Sites

Microsociety

http://www.microsociety.org/

Definitions, descriptions, and links to schools around the United States and teacher resources for planning and organizing a microsociety. Follow the links to activities, program design, assessment and evaluation, and history of the microsociety concept.

Northwest Regional Educational Laboratory
http://www.nwrel.org/edwork/reality/mayjune97/article1.html
Reality Check Newsletter is published by the Education and Work program of the Northwest Regional Educational Laboratory. This issue describes workshops and conferences providing the nuts and bolts of organizing a microsociety program, linking microsociety programs to national standards, building community partnerships, and developing appropriate assessment methods.

The Detroit News
http://www.detnews.com/1997/detroit/9702/05/01300019.htm
David C. Butty. "Taking it from School to Life: Students Connect to the Real World Through Classroom Practice." *The Detroit News,* 1997, January 30. Describes a microsociety program at William Davison Elementary School.

SCT Boces-Elmira, NY
http://www.sctboces.org/microsociety
A description of the build-a-town experience

Profile No. 8: The Museum Method

The museum method uses the metaphor of museum to encourage students to plan, organize, and display their learning about a particular issue, place, person, object, or event. The museum method invites students to become explorers, researchers, scholars, curators, collectors, designers, assemblers, managers, and teachers.

The museum method involves more than just visiting a museum, although a trip to a museum could be one of the "staging activities" used to motivate students. Students work in teams to discuss and justify the selection of specific artifacts for display (working through ethical issues, if any), and then create, display, and explain their exhibit. Students assume authentic organizational roles as they plan, manage, and operate a museum.

For example, in an eighth grade science class in Athens, Tennessee, students assume the roles of museum director, assistant director, conservator, registrar, head of public affairs, designer, and educator. Students are provided a written job description plus a set of decisions or questions that they must resolve about the gallery. (For more information about this program, contact Joy Runyan at runyanj@ael.org.)

Example—*Living Wax Museum*

Fourth graders participated in a "living wax museum" as a joint project of two classes. Each student chose a famous person, memorized facts about the person's life, wrote a biographical sketch, and presented oral reports. Parents were then invited to visit a living wax museum that featured students using appropriate props and dressed as the famous people they had studied. During the hourlong exhibit, students assumed a motionless pose.

Source: P. Owen. "History Figures Come Alive in Classes." *The Gardner Daily News*. Gardner, MA, 1998.

The museum method invites students to become explorers, researchers, scholars, curators, collectors, designers, assemblers, managers, and teachers.

Print and Media Resources

Crockett, T., and T. Gangwer, eds. *Visual Learning Guide and Activity Book*. Cambridge, MA: Polaroid Corporation, 1994.

Koetsch, P., M. Daniels, T. Goldman, and C. Leary. "Student Curators: Becoming Lifelong Learners." *Educational Leadership 51*(5), 54-57 (1994).

MacFarlane, R. B. *Making Your Own Nature Museum*. New York: Franklin Watts, 1989.

Wallach, C., and S. Callahan. "The 1st Grade Plant Museum." *Educational Leadership 52*(3), 32-33, 34 (1994).

Web Sites and Electronic Discussion Lists

The Curry School of Education-University of Virginia
http://curry.edschool.Virginia.EDU/curry/class/Museums/Teacher_Guide/
Teacher's guide to museum visits

Museum of Science-Boston
http://www.mos.org
A cyberspace field trip to Boston's Museum of Science

Old Sturbridge Village-Massachusetts
http://www.osv.org
A cyberspace field trip to Old Sturbridge Village in Sturbridge, Massachusetts

The Brooklyn Friends School
http://www.brooklynfriends.org
Examples of student museum projects

RA-INFORMAL-ED
The Regional Alliance for Mathematics and Science Education operates a listserv for the dissemination of information about

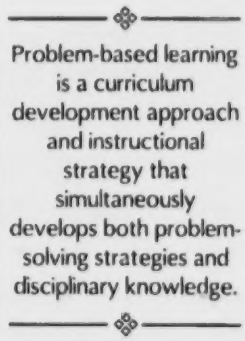
informal science education. Subscribers include museum directors, education coordinators, and exhibit developers from aquariums, aviaries, botanical gardens, nature centers, observatories, planetariums, science centers, and zoos. To subscribe, send an e-mail message to ra_manager@list.terc.edu (leave the subject line blank). In the body of the message, type: join ra-informal-ed. After you have been subscribed, post your messages to ra-informal-ed@list.terc.edu.

Profile No. 9: Problem-Based Learning

Problem-based learning focuses on experiential learning organized around the investigation and resolution of messy, real-world problems. Problem-based learning is a curriculum development approach and instructional strategy that simultaneously develops both problem-solving strategies and disciplinary knowledge. Students are engaged in the roles of various stakeholders immersed in a purposefully ill-structured problem situation. Students become involved as active, self-directed learners. Teachers play roles as cognitive coaches and problem-solving colleagues.

Students in a problem-based learning module are involved in tasks such as determining whether a problem exists, creating an accurate statement of the problem, determining what information is missing and how to find it, generating and analyzing possible solutions, and making written or oral presentations. There are six steps in a problem-based learning module.

1. **Present the problem statement.** Introduce an "ill-structured" problem or scenario to students. They should not have enough prior knowledge to solve the problem. This simply means they will have to gather necessary information or learn new concepts, principles, or skills as they engage in the problem-solving process.
2. **List what is known.** Under the heading "What do we know?," student groups list what they know about the scenario. This may include data from the situation as well as information based on prior knowledge.
3. **Develop a problem statement.** A problem statement should come from the students' analysis of what they know. The problem statement will probably have to be refined as new information is discovered and brought to bear on the situation. Typical problem statements may be based on discrepant events, incongruities, anomalies, or stated needs of a client.
4. **List what is needed.** Students will need information to fill in


Problem-based learning is a curriculum development approach and instructional strategy that simultaneously develops both problem-solving strategies and disciplinary knowledge.

missing gaps. A second list is prepared under the heading "What do we need to know?" These questions will guide searches that may take place on-line, in the library, and in other out-of-class searches.

5. **List possible actions, recommendations, solutions, or hypotheses.** Under the heading "What should we do?," students list actions to be taken (e.g., questioning an expert) and formulate and test hypotheses.
6. **Present and support the solution.** As part of closure, teachers may require students to communicate their findings and recommendations orally and/or in writing. The product should include the problem statement, questions, data gathered, analysis of data, and support for solutions or recommendations.

Students share their findings on-line with teachers and students in schools within the district, region, or state; across the nation; or internationally. Teachers find that students pay more attention to quality when they present or show their written products to students in other schools.

Example---*Oh, Deer, What Can the Matter Be?*

Fifth grade students at the Lincoln School in Mundelein, Illinois, wrestle with the issue of deer overpopulation. In the problem scenario, students learn that deer are spreading disease, damaging property, and endangering people. They are asked to advise the citizens of North Haven, New York, where more than 50 percent of the citizens have contracted Lyme disease from the tick that deer carry. Using information and data gathered during their inquiry, students develop a plan to address the problem in such a way that deer and human populations can coexist and remain healthy, property is not damaged, and humans are not put in danger.

Source: Mundelein School District #75, Lincoln School, 200 West Maple Avenue, Mundelein, IL 60060; 847-949-2701; North Cook Intermediate Service Center-Illinois, http://www.ncisc.org/ealford/deer_problem.html.

Print and Media Resources

Association for Supervision and Curriculum Development. *Problem-Based Learning* (two-videotape series). Alexandria, VA: ASCD, 1997.

Delisle, R. *How to Use Problem-Based Learning in the Classroom.*

Alexandria, VA: Association for Supervision and Curriculum Development, 1998.

Finkle, S., and L. Torp. *Garbage to Gold: Problems as Possibilities*. Aurora, IL: IMSA Center for Problem-Based Learning, 1996. http://www.imsa.edu/team/cpbl/whatis/garb/index.html (15 May 2000).

O'Neil, J. "Rx for Better Thinkers: Problem-Based Learning." *ASCD Update* 34 (6), 1, 4-5 (1992).

Stepien, W., and S. Gallagher. "Problem-Based Learning: As Authentic as it Gets." *Educational Leadership* 50(7), 25-28 (April 1993).

Torp, L., and S. Sage. *Problems as Possibilities: Problem-Based Learning for K-12 Education*. Alexandria, VA: Association for Supervision and Curriculum Development,1998.

Teachers find that students pay more attention to quality when they present or show their written products to students in other schools.

Other Resources

ASCD Network on Problem-Based Learning
Linda Torp, Director
Research and Evaluation
Illinois Math and Science Academy
1500 W. Sullivan Road
Aurora, IL 60506-1000
630-907-5956, ext. 57
630-907-5918 (fax)

ASCD Network on Problem-Based Learning
Center for Problem-Based Learning
Illinois Math and Science Academy
1500 W. Sullivan Road
Aurora, IL 60506-1000
630-907-5956, ext. 57
630-907-5946 (fax)

Web Sites and Electronic Discussion Lists

Illinois Mathematics and Science Academy
http://www.imsa.edu/team/cpbl
Center for Problem-Based Learning; features introductory tutorial, guidance on designing a problem-based unit, bibliography, and more

IMSACPBL-L
A dialogue list for problem-based learning in grades K-16. To subscribe, send an e-mail message to majordomo@imsa.edu (leave the subject line blank). In the body of the message, type: subscribe

imsacpbl-l yourfirstname yourlastname After you have been subscribed, post your messages to imsacpbl-l@imsa.edu.

Profile No. 10: The Project Approach in Early Childhood Education

Elementary schools throughout the United States, and even pre-primary schools modeled after programs established in Reggio Emelia, Italy, widely use the project approach. This approach deliberately focuses on researching questions posed either by the children, the teacher, or the teacher collaborating with children. The goal of the project approach is to learn more about the topic rather than to find right answers to questions posed by the teacher. Students apply their emerging skills while strengthening positive dispositions for learning. When using the project approach, teachers plan and organize learning around three phases of project work:

Phase 1—Getting Started. Teachers and students participate in many sessions to select and refine the topic they will investigate. The topic must

- relate closely to everyday experience
- allow for integration of curricula
- be researchable through available resources such as field sites, experts, and other materials
- be rich enough to be explored for at least a week

Teachers and students brainstorm a web or concept map displaying the topic and subtopics they will use for discussions and debriefings as the work continues.

The goal of the project approach is to learn more about the topic rather than to find right answers to questions posed by the teacher.

Phase 2—Field Work. Teachers and students engage in direct investigations, including field trips and/or visits from experts to investigate sites, objects, or events. Students collect data; take notes; sketch from observations; predict; pose questions; and construct models, charts, graphs, posters, books, reports, board games, and other representations to communicate new understandings. They participate in group discussions to share findings.

Phase 3—Culminating and Debriefing Events. Students report findings or results to teachers, students, parents, and community members through displays, reports, artifacts, talks, dramatic presentations, or guided tours. They reflect on their progress and begin to formulate ideas for their next project.

Advocates of the project approach point out that this method

allows students to apply emerging skills and develop positive attitudes toward learning. It also addresses proficiencies, stresses intrinsic motivation, and encourages students to make decisions about their own learning through negotiation and collaboration with the teacher. During a project, teachers make plans for discussions with the children, as a whole class and in small groups. Weekly plans include time to work on projects as well as to complete other class work. Project plans require rough time lines for each phase of project work (discussion, fieldwork, investigation, representation, and display). Assessment plans include displays, rubrics for self-evaluation and/or teacher evaluation, and project folders.

Example—*Rocks*

To begin a project on rocks, notes were sent home to parents to inform them of the study and encourage them to participate. During Phase 1, both the students and the teacher told, published, illustrated, and displayed personal stories about rocks. Children answered open-ended questions about rocks and made charts of responses. Phase 2 began with a field experience to the hills adjacent to the school. After gathering and documenting data, students began to engage in various investigations. The class was also visited by three experts: an environmental educator, a geologist, and a garden hobbyist. Upon completion of the investigations, invitations were sent to parents, colleagues, and the community. A three-dimensional bluff was the focal point of the display. Sixty-four people attended to view displays and listen to the children's explanations.

Source: Dot Schuler, Grafton Elementary School, P. O. Box 205, Grafton, IL 62022; 618-786-3388; dschuler@planetnet.com Plantnet Internet; http://www.plantnet.com/dschuler

Advocates of the project approach point out that this method allows students to apply emerging skills and develop positive attitudes toward learning.

Print and Media Resources

Chard, S. C. *The Project Approach: A Practical Guide for Teachers.* Edmonton, Alberta: University of Alberta Printing Services, 1992.

Helm, J. H., ed. *The Project Approach Catalog.* Champaign, IL: ERIC Clearinghouse on Elementary and Early Childhood Education, 1996.

Katz, L. G. *The Project Approach.* Champaign, IL: University of Illinois, Clearinghouse on Elementary and Early Childhood Education, 1994. ERIC Document Reproduction Service No. ED 368 509.

Katz, L. G., and S. C. Chard. *Engaging Children's Minds: The Project Approach.* Norwood, NJ: Ablex Press, 1989.

Levy, S. *Starting from Scratch: One Classroom Builds its Own Curriculum.* Portsmouth, NH: Heinemann, 1996.

Schack, G. A. "Involving Students in Authentic Research." *Educational Leadership 50*(7), 29-31 (1993).

Wolk, S. "Project-Based Learning: Pursuits with a Purpose." *Educational Leadership 52*(3), 42-45 (1994).

Web Sites and Electronic Discussion Lists

University of Alberta

http://www.ualberta.ca/~schard/projects.htm

Sylvia Chard's Project Approach Home Page. Sylvia is co-owner of the PROJECTS-L discussion list. See the story and outline of the cafeteria project.

ERIC Clearinghouse on Elementary and Early Childhood Education

University of Illinois at Urbana-Champaign

http://ericps.crc.uiuc.edu/eece/project.html

The Project Approach Web site of the Clearinghouse on Elementary and Early Childhood Education. Hot links to ERIC/EECE digests on topics related to the project approach, excerpts from the project approach catalog, bibliographic citations of journal articles and ERIC documents related to the project approach, and other resources.

PROJECTS-L

Listserv discussion group for anyone interested in the use of the project approach in early childhood and elementary education. Most projects involve students' collaborative inquiries into real-life situations requiring observation and measurement of actual phenomena. To subscribe, send an e-mail message to Listserv@postoffice.cso.uiuc.edu (leave the subject line blank). In the body of the message, type: subscribe PROJECTS-L yourfirstname yourlastname. After you have been subscribed, post your messages to PROJECTS-L@postoffice.cso.uiuc.edu.

Profile No. 11: The Senior Project

Senior projects provide an opportunity for high school seniors to work on intensive, in-depth projects of their own choosing. Projects might focus on one or more areas: academic skills, creative expression, service to community, or career development.

At South Medford High School in Medford, Oregon, all students select an area of interest and write a bona fide research paper, complete a 15-hour physical project, and make a presentation to a panel of community members and teachers. In general, a senior project not only emphasizes writing and speaking but also challenges students to demonstrate decision making, long-term planning, and problem solving.

Not all schools require that seniors complete a project to fulfill school or district graduation requirements, but senior projects are a way to allow students to demonstrate knowledge in one or more fields of their own choosing. The students obtain this knowledge by doing intensive research, sometimes with a community mentor. This research is demonstrated through an oral presentation, a written document, and some type of multimedia project—for example, designing an engine, creating a painting, or producing a video or an audiotape.

Example—*King Richard III*

Students complete senior projects in different ways—for example, through independent study or as part of a class. Each independent study project has a faculty advisor. Many use a written student contract similar to the one illustrated below.

Contract for Project on King Richard III

1. I will keep a journal in which I write at least 20 entries over the course of the project.
2. I will write a 2,500-word paper on the political and personal history of Richard III and the propagandistic nature of Shakespeare's Richard III.
3. I will deliver a 10-minute speech derived from the paper.
4. I will produce a 10-minute live excerpt from Richard III, which I will direct and in which I will perform with others as necessary.
5. I will meet with my advisor twice a month.

Source: Adapted from Geocities
http://www.geocities.com/Athens/Forum/8201/contract.htm

Senior projects are viewed by many as valuable learning experiences because they

- involve goal-setting and time management skills
- require students to document time and effort spent on each activity, using written forms, contracts, and interim products to monitor progress

A senior project not only emphasizes writing and speaking but also challenges students to demonstrate decision making, long-term planning, and problem solving.

- may involve a mentor to help guide the student in the development of a proposal or a product
- require students to complete learning activities outside of school
- demand a learning stretch (intellectual, physical, or emotional)

Print and Media Resources

Glasgow, N. A. "Mentored Educational Relationships." In *New Curriculum for New Times: A Guide to Student-Centered, Problem-Based Learning,* 116-35. Thousand Oaks, CA: Corwin Press, 1997.

Web Sites

InternetCDS-Senior Project Perspective
http://www.cdsnet.net/Business/WestEDGE/senior.htm
Teaching strategies, seminar content, and classroom materials developed by educators in Medford, Oregon

Camas School District #117
http://www.camas.wednet.edu/chs/curric/sr_proj/srproj.html
The Senior Project at Camas High School; project time line and sample proposal

Southeastern Ohio Regional Freenet
http://www.seorf.ohiou.edu/~xx008/hide/senproj97/projprop.html
Senior project proposal and requirements at Federal Hocking High School in Stewart, Ohio. Follow the links to portfolio requirements, project evaluation, and presentation rubric.

Senior projects are viewed by many as valuable learning experiences.

Profile No. 12: Service Learning

Service learning programs allow students to apply skills they have learned in school to carry out meaningful work in their communities. Generally, students do not receive financial compensation for their contributions. Service learning is based on a belief that all students should participate in experiences that develop good character and citizenship.

High-quality service learning projects are planned and coordinated with the community and are thoughtfully organized to address real school or community needs. They are structured in a way that encourages students to think, talk, or write about the experience. Totten and Pedersen (1997) identify three essential features in successful projects: (1) preparing the students for the activity, (2) linking the activity to a contextual basis in the

curriculum, and (3) deriving meaning through structured reflection with adults. By putting newly acquired skills and knowledge to use through serving others, students can develop a sense of caring and accomplishment.

Service learning projects usually encompass five phases:

1. **identifying an appropriate project**—determining student and community needs
2. **planning, preparation, and organization**—deciding who will do what, with whom, and when
3. **engaging in a service experience**—following through on commitments
4. **documenting and reporting on the experience**—observing and analyzing the service
5. **reflecting on the experience**—developing new understandings and next steps

Here are just a few examples of service learning projects:

- leading a drive to collect clothing, food, and toys for shelters and hospitals
- conducting book and magazine drives for homeless shelters
- making or collecting big books and games to donate to day care centers
- preparing and distributing food in soup kitchens and homeless shelters
- creating educational displays about city agencies
- establishing a recycling program
- designing environmental awareness displays
- participating in environmental cleanup projects
- making social visits to nursing homes
- tutoring younger students

Service learning is based on a belief that all students should participate in experiences that develop good character and citizenship.

Example—*Community Youth in Action*

The Community Youth in Action model at Washington Heights uses teams of students ranging from 11 to 18 years of age to design a sustained three- to eight-month service project through weekly participation. Typical service projects include peer tutoring, making sleeping bags for the homeless, painting neighborhood murals, and organizing serv-a-thons that involve many community members.

Source: Fresh Youth Initiatives, 280 Fort Washington Avenue #5, New York, NY 10032; 212-781-1113

Print and Media Resources

Kinsley, C. W., and K. McPherson. *Enriching the Curriculum Through Service Learning*. Alexandria, VA: Association for Supervision and Curriculum Development, 1995.

Lincoln Filene Center Community Service Learning Program. *Coordinator's Handbook*. Medford, MA: Tufts University, 1989. Available from Lincoln Filene Center, Medford, MA 02155; 617-641-3858; $20.00.

National Center for Service Learning in Early Adolescence. *Reflection: The Key to Service Learning*. New York: CASE/SUNY, 1991. Available from CASE/SUNY, 25 West 43rd Street, Suite 612, New York, NY 10036-8099; 212-642-2946; $15.00.

Silcox, H. *A How-to Guide to Reflection: Adding Cognitive Learning to Community Service Programs*. Holland, PA: Brighton Press, 1993.

Totten, S., and J. E. Pedersen. *Social Issues and Service at the Middle Level*. Boston: Allyn & Bacon, 1997.

West Publishing Company. *Hearts and Minds Engaged* (videotape). St. Paul, MN: West Publishing Company, 1994.

Willis, S. "Learning through Service." *ASCD Update* 35(6), 1, 4-5, 8 (1993).

Other Resources

ASCD Service Learning/Experiential Learning
Jan Schollenberger-Koenig, Consultant
2109 Wynnewood Drive
Valpariso, IN 46383
219-462-3986

Web Sites and Electronic Discussion Lists

The Association for Supervision and Curriculum Development
http://www.ascd.org/services/eric/ericser.html
Selected ERIC abstracts on service learning

National Service-Learning Clearinghouse
http://www.nicsl.coled.umn.edu
The National Service-Learning Clearinghouse offers guides to developing service learning programs, literature lists, a newsletter, technical assistance packets, videotapes, and topic bibliographies for all grade levels. Links to schools and community-based organizations and programs

National Youth Leadership Council
http://www.nylc.org/
The National Youth Leadership Council produces service learning curriculum materials and training resources for educators, policymakers, and advocates of service learning; features links to related Web sites

Quest International
http://www.quest.edu/slarticle17.htm
Summary of research findings on school-based community service by Dan Conrad and Diane Hedin

NSLCK-L@ tc.umn.edu
A discussion list for persons interested in K-12 community service learning. To subscribe, send an e-mail message to listserve@ tc.umn.edu (leave the subject line blank). In the body of the message type: sub nslck-12 yourfirstname yourlastname. After you have been subscribed, post your messages to listserve@ tc.umn.edu.

Profile No. 13: Work-Based Learning

Work-based learning approaches vary considerably and can include practices that are part of service learning, experiential learning, experience-based career education, school-to-work initiatives, cooperative education, tech prep, youth apprenticeships, coordinated workforce development, job shadowing, internships, mentoring, and other school and community programs. Most are built on a foundation of beliefs and assumptions such as the following.

1. Apprenticeship is a way of life and a legitimate learning strategy.
2. Education must be viewed as a continuum from preschool through adulthood.
3. Jobs of the future will require critical thinking, teamwork, and the ability to apply knowledge.
4. Involvement of the family, business, labor, the community, and other agencies in educating youth is essential.
5. We learn best when we direct our own learning.
6. We learn most effectively in a specific context.
7. We learn from each other.
8. We need to learn how to capture our learning and share it with others.
9. We need to learn how to recognize and question our assumptions.

Work-based learning may occur in a variety of forms. Naylor (1997) describes some of these.

- **Contracted instruction**—career and technical education instruction and support services provided to students by a business, industry, or private education agency through formal written agreements with public education agencies
- **Cooperative education**—programs that combine classroom instruction with employment
- **School-to-work apprenticeship**—work-based programs in which employers, employer associations, or employers and unions establish programs allowing high school students to participate in registered apprenticeships while completing their high school graduation requirements
- **Registered apprenticeship**—conventional apprenticeship programs registered with the Bureau of Apprenticeship and Training
- **Career exploration**—programs that involve job shadowing and/or worksite mentors
- **Service learning**—programs that combine meaningful community service with academic learning, personal growth, and civic responsibility
- **Career internships**—programs in which students spend time in a business, industry, or other organization to gain insight and direct experience
- **Career academies**—schools typically organized around a single employer or consortium of employers in an industry and designed to increase awareness of career opportunities within particular occupational areas and teach the basic, life, and employment skills required for jobs or further training
- **School-based enterprise**—programs in which groups of students produce goods or services for sale

Example—*On Location*

On Location is sponsored by the Community Partnership for Lifelong Learning program in Benton Harbor, Michigan. On Location brings groups of two to eight sixth-grade students, accompanied by a teacher supervisor, to a business location for a one-week internship. Students receive assignments based on academic skill interests and availability of participating businesses. A portion of each day is spent as a group. During group meetings, discussion and journal writing help students connect the curriculum and the workplace.

On Location internships help both students and teachers understand the importance of applying communication, computer literacy, problem-solving, teamwork, and creative expression skills. Students experience the real-world relevance of what they learn in various subject areas in school. Students use the direct experience to choose elective subjects and possible future careers.

Source: Community Partnership for Lifelong Learning, 38 West Wall Street, P. O. Box 428, Benton Harbor, MI 49023-0428; 616-925-6100; apscholka@cstonealliance.org

Print and Media Resources

Bailey, T., and D. Merritt. "School-to-Work for the College-Bound." *Education Week* (1997, October 29).

The Massachusetts Center for Career and Technical Education. *Smart Projects: The Learning Stretch*. Lexington, MA: The Massachusetts Center for Career and Technical Education, 1996.

Naylor, M. (1997). *Work-Based Learning*. ERIC Digest. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education. ERIC Document Reproduction Service No. ED 411 417.

Trotter, A. "Curriculum Project to Integrate Academic, Job Standards." *Education Week* (1997, May 7).

Other Resources

ASCD Workforce 2000: Work and Workers for the 21st Century
Linell Burrell, Consultant
3488 Balfour Road
Detroit, MI 48224
313-885-5053
313-885-2798 (fax)

Web Sites

Association for Supervision and Curriculum Development
http://www.ascd.org/services/eric/stw.html
Selected ERIC abstracts on school-to-work

Northwest Regional Educational Laboratory
http://www.nwrel.org/scpd/sirs/10/t008.html
Topical Synthesis No. 8, *Community-Based Learning: A Foundation for Meaningful Education Reform*, by Thomas R. Owens and Changhua Wang

Students experience the real-world relevance of what they learn in various subject areas in school.

Cornell University
http://www.human.cornell.edu/youthwork/rtools/
Follow the links to select and adapt tools for evaluating programs and student learning, interviewing participants in youth and work programs, observing workplace learning, and surveying youth about their experiences

School-to-Work News
http://www.stwnews.org/STWNews.htm
On-line newspaper links to information about K-12 funding opportunities, apprenticeships and internships, cooperative learning opportunities, effective practices, establishing partnerships, and resources for school-to-work initiatives.

Center on Education and Work-University of Wisconsin
http://www.cew.wisc.edu
Focuses on school-to-work, tech prep, and coordinated workforce development

School-to-Work
http://www.stw.ed.gov
Practical examples of checklists, apprenticeship contracts, integrated curricula, and other tools

National 4-H Council
http://www.fourhcouncil.edu/ycc/WSCANS.HTM
The SCANS 2000 workplace competencies

National Center for Research in Vocational Education
University of California-Berkeley
http://ncrve.berkeley.edu/
Newsletters, monographs, skill standards links, and links to other school-to-work Web sites

Chapter 3
Steps for Teachers in Planning and Managing Student Projects

The step-by-step breakdown presented here is designed to help teachers prepare for a successful project-based learning experience. The first time a teacher involves a class in project-based learning, he or she might feel some apprehension about planning and managing student work. Planning a project with teachers from other grades or curriculum areas can be an effective way to overcome apprehension, incorporate interdisciplinary elements into a project plan, and build a base for future project work within the school.

Keep in mind, also, that students may need to be eased into project work if this is their first experience with it. Those who have not developed research skills or worked in cooperative learning groups might be less prepared for project work than those who have had these experiences. It is wise to keep these factors in mind in deciding the duration, complexity, and approach for the first project the class undertakes.

Step 1. Choose a focus for the project.
Step 2. Identify essential knowledge and skill areas to be learned through project activities.
Step 3. Introduce the project and involve students in shaping it.
Step 4. Select a balance of teacher-led and student-centered activities.
Step 5. Establish project time lines and milestones.
Step 6. Monitor student progress using planning, reporting, and feedback tools.
Step 7. Evaluate project impact and learning results.
Step 8. Reflect on gathered data and plan next steps.

Step 1: Choose a focus for the project.

What are you trying to achieve by assigning project work? What learning standards will the project address? The answers to these questions form a starting point for planning project work. It is also important to consider which project type (or combination of types) might best help students achieve the objectives you have in mind. Although most approaches are adaptable to different grade levels, the chart below suggests grade levels where particular project approaches fit especially well. See Chapter 2 for specific information about each approach.

The selection of a project focus is highly individual and situational. Teachers who think that their learners need experience in considering alternative points of view may opt for a problem-based scenario. Students who need to be able to function better in groups may benefit from expeditionary learning or service learning models. Teachers who want their students to have more opportunities to make choices and decisions may choose the project approach, Foxfire, or microsociety methods. Different models suggest different intersections of experience (see Figure 3.1).

	Elementary School	Middle School	High School
Project Approach	✓		
Design & Technology Experience	✓	✓	✓
Foxfire Approach	✓	✓	✓
Problem-Based Learning	✓	✓	✓
Work-Based Learning		✓	✓
Field Study		✓	✓
Enviromental Investigation	✓	✓	✓
Community Study	✓	✓	✓
Expeditionary Learning	✓	✓	✓
Microsociety	✓	✓	
Museum Method	✓	✓	✓
Senior Project			✓
Service Learning	✓	✓	✓

✓ = "especially suited to these grade levels"

Figure 3.1. Grade levels and project types

The type of project selected should be a legitimate vehicle for achieving curriculum standards and should match the learners' needs and interests. In some cases, this may mean rekindling a sense of place through community study, environmental investigation, or service learning. Or it could mean cultivating career choices through field studies, senior projects, or service learning.

Step 2: Identify essential knowledge and skill areas to be learned through project activities.

Elaborate on the specific learning goals (knowledge, skills, attitudes) you hope to achieve through project activities. Which of these will you need to introduce or review at key points in the project? Which performance standards will your projects emphasize through hands-on demonstration and practice? How will you assess student mastery of standards? At this point, you should identify specific methods of assessment (products, performances) and develop performance criteria. You also should decide *if* and *how* you will use student self- and peer-assessments. Your plan may also need to identify resources (print, media, technology, or human) needed to support the project and address logistical requirements (scheduling, funding, travel arrangements, or collaborative partnerships). See Figure 3.2.

A project's richness, rigor, and relevance are determined by how well it is designed to help students master key subject area concepts or skills; develop higher-order thinking skills such as analysis, synthesis, and evaluation; integrate literature across the curriculum; use student interests and questions in framing the study; and emphasize student writing and product development.[1] These same design considerations can help students develop the skills that will be needed in the workforce.[2] Increasingly, employers are seeking employees who are able to

1. organize and use information—know how to locate, access, interpret, and explain to others the essence of a complex concept, problem, or issue
2. consider and choose among alternatives—be able to identify several different solutions, strategies, perspectives, or points of view and select a best-fit solution
3. demonstrate conceptual understanding—grasp important ideas, theories, or perspectives in the content areas
4. apply processes—engage in appropriate inquiry, research, or communication

Planning Considerations
Learning to be Assessed knowledge
skills
attitudes
Resources print
media
technology
human
Logistical Requirements scheduling
funding
partnerships

Figure 3.2. Planning considerations

5. write well—express ideas clearly and provide supporting details for explanations, interpretations, or evaluations
6. investigate problems—address concepts, problems, or issues local and global contexts
7. present findings to targeted audiences—communicate knowledge through products or performances provided to community groups, agencies, or partner institutions

Figure 3.3 shows how a community study project can provide opportunities for students to learn through practical application.

Step 3: Introduce the project and involve students in shaping it.

How will you introduce project requirements to students? Your introduction may be as simple as announcing project due dates, requirements, and expectations and distributing printed information. On the other hand, the introduction phase may mean preparing students for collaborative work through structured activities in team communication, group problem-solving, and consensus building.

It is important not to overplan the project before getting student input. Involving students in shaping the direction of the project fosters motivation and encourages responsibility and autonomy.[3] Essential learning standards must be demonstrated through project work, but not everyone has to do the same thing in the same way.

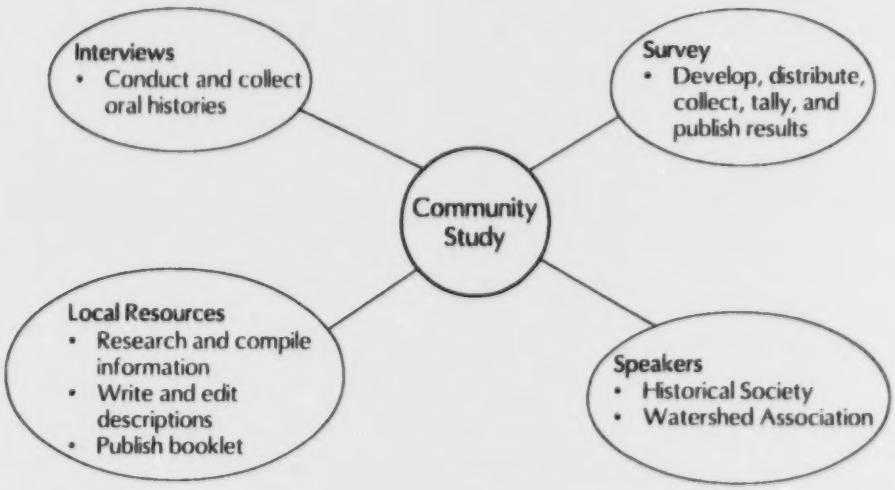


Figure 3.3. Providing opportunities through practical application

Essential learning standards must be demonstrated through project work, but not everyone has to do the same thing in the same way.

This would be a good time to involve students in decisions about final products and performances. They may review your list and suggest other options. It is also wise to involve students in a discussion of performance criteria and allow them to have input in deciding what criteria will be used to evaluate their projects.

In problem-based learning situations, teachers or their community partners often introduce an "ill-defined problem" or "messy" situation that requires discussion, research, and sorting out before the real nature of the project work becomes clear. This model was developed for use with medical students in Canada.[4] Once students have contributed to the big question, they brainstorm to decide what they want to find out about their topic. Using a videotape, guest speaker, or field trip can stimulate investigative questions. Teams can review questions and group them into categories and subtopics.

Interdisciplinary projects and theme-based units are often strengthened when they are framed by an organizing question or problem statement that leads students to grapple with key concepts. In determining an organizing focus, consider these factors:

Ideas of significance—what really matters in life, and how can schools help students with these issues?

- "Our Place in History"
- "My Role as a Global Citizen"
- "Family and Community"

Overarching concepts—the broader the concept, the more likely that aspects of all subjects can be incorporated into the inquiry. Sometimes these can be framed as apparently contradictory sets of conditions.

- "Past and Present"
- "Unity and Diversity"
- "Change and Continuity"

Unifying constructs—a course or project can be organized around one or more ideas or images that tie together student work over time.

- "Inquiry and Expression"
- "Evidence and Argument"

Underlying metaphors—This approach uses word play and intellectual playfulness to capture the essence of project activity

and purpose. What metaphors capture what you would like your students to know or be able to do?

- "Through a Glass Darkly" (perspective)
- "Looking Beneath the Surface" (pond investigation)

Threads that weave through the curriculum—What essential skills or processes that are valued in all disciplines could be practiced through an interdisciplinary project?

- "Folktales and Storytelling"
- "A Community Newspaper"
- "Mock Trial or Election"

Questions that help students to interpret facts and events—Questions lend drama and importance to student investigations. By teaching students to frame proposed projects as questions, the inquiries become more open-ended.

- "Is America a Just Society?"
- "Can Music Be Mathematical?"
- "Is Our Community Drinking Water Safe?"

Step 4: Select a balance of teacher-led and student-centered activities.

A project is not something the teacher presents, but something the students do. The teacher may still need to provide some direct instruction during project work, so that the students develop and demonstrate the knowledge and skills needed to successfully complete the project. Completing the grid (see Figure 3.4) helps planners design projects that are rich in learning opportunities,

Teacher-Led Activities	Individual Tasks	Team Investigations	Community Connections

Figure 3.4. Resources needed to support project

comprehensive in scope, and based on whole-group, small-group, and individual task structures.

For example, when Charles Jervis, Steve Bull, and Jerry Sauter were planning their Nation of Immigrants unit at Auburn High School in Riner, Virginia (see Appendix B for full description), they decided there were some things teachers needed to do explicitly to help set tone and expectations. These included leading class discussions, introducing concepts and terms, and monitoring student writing/response journals. The teachers used these opportunities to model the way students should approach their projects. They kept individual students accountable by assigning reading materials, reflective response essays, and short oral summaries. The teacher team placed primary responsibility for project work on teams of student investigators. Each team compiled information relevant to its question, developed a team portfolio of products, presented its understandings, and defended its position. Each team was given the opportunity to revise its work. Jervis, Bull, and Sauter arranged for students to conduct interviews with community members, some of whom helped students develop products for their team portfolios on immigration issues.

Step 5: Establish project time lines and milestones.

The typical project lasts for two to eight weeks. In determining how much time to spend on a project, the teacher must consider how much of the course curriculum is addressed by the project and how much time students will need to carry out planned activities that address state and national standards. For examples of various time lines, see the sample projects in Appendix B. A sample time line is shown on page 55.

Example Project Time Line

Week One—
- Form project teams
- Select a topic or question for investigation
- Complete project plan
- Begin exploration

Week Two—
- Collect data and information
- Process questions and findings
- Organize results
- Interpret findings
- Reflect on implications and understanding
- Revise inquiry as needed
- Refine conclusions and generalizations

Week Three—(Optional)
- Compete against other teams
- Submit prototypes for trials
- Rehearse skits or demonstrations
- Present final report, product, exhibition, or display

Step 6: Monitor student progress using planning, reporting, and feedback tools.

How will you know that individuals or teams are on track and on time? In many project models, individual students on a team select a topic to investigate. Team members formulate a problem statement, divide the research responsibilities, and help one other discuss and plan work as it progresses. The teaching team may devise both individual and team report forms, interim products, and sharing sessions to provide evidence of accomplishments. Here are some examples of planning, reporting, and feedback tools:

- project proposal form
- references consulted list
- individual assignment checklist
- interview planning page
- peer evaluation of contributions to project completion

Step 7: Evaluate project impact and learning results.

The teacher or teaching team may assess different dimensions of student work completed during the project. Usually a project will include more than one method of assessment. Teachers frequently combine traditional tests with performance-based assessments to compile an overall project grade. The assessments may be based on individual tasks or some combination of individual and group accomplishments. Here are examples of accomplishments that might be assessed.

The key to successful demonstration of student learning is to provide students with your expectations *at the beginning of the project.*

- selecting a focus of inquiry
- gathering information from a variety of sources
- analyzing and interpreting information
- deriving reasonable generalizations, conclusions, or recommendations
- reporting and communicating findings; reflecting on their investigations and discussing results

Other areas might also be assessed:

- attitudes
- content knowledge
- skill development
- work habits

The key to successful demonstration of student learning is to provide students with your expectations *at the beginning of the project.* Involve them in shaping assessment tasks and scoring criteria. And, show them models of quality products and performances as well as some that do not illustrate excellence. Involve them early on in establishing criteria for success.

Step 8: Reflect on gathered data and plan next steps.

A project evaluation almost always suggests areas of possible improvement. Adequate reflection about student engagement and achievement can help teachers refine project plans. Here are a few sample reflective questions that the teacher or teaching team might raise in reflecting on a newly completed project.

What worked well?
What didn't?
What would we do differently the next time?

Our students did well with...
Our students had difficulty with...
We can do _____ to better prepare our students.

What we'd add the next time...
What we'd leave out the next time...
What we'd improve on or refine...

The teaching team may also participate in an overall evaluation of project effectiveness. Here are some questions that the team might ask.

- Was the type of project selected a good vehicle for reaching the learning goals intended? (Appropriateness)
- Were the project activities extensive enough to permit thorough practice in using the desired knowledge or skill? (Adequacy)
- Were the products and performances a valid way to assess student understanding and to demonstrate knowledge and skills in use? (Effectiveness)

When Jeri Giachetti, English teacher at John Rogers High School in Spokane, Washington, evaluates learning results in the project "To Make a Difference," she uses both a formal scoring guide and a self-/peer evaluation form (see Appendix B).

Notes

1. J. G. Brooks and M. G. Brooks, *In Search of Understanding: The Case for Constructivist Classrooms* (Alexandria, VA: Association for Supervision and Curriculum Development, 1993), 16-17.
2. C. S. Bruce, "Workplace Experiences of Information Literacy," *International Journal of Information Management 19:* 31-47 (1999).
3. K. Bartscher, B. Gould, and S. Nutter, *Increasing Student Motivation through Project-Based Learning*. Master's Research Project, Saint Xavier and IRA Skylight, 1995. ERIC Document Reproduction Service No. ED 392 549.
4. H. S. Barrows, *The Tutorial Process* (Springfield, IL: Southern Illinois University School of Medicine, 1992).

Annotated Resource List
Selected References on Organizing, Managing, and Assessing Student Projects

Alexander, W. M. *Student Oriented Curriculum: Asking the Right Questions*. Columbus, OH: National Middle School Association, 1995.
Practical advice for starting student project work, particularly for middle-grade educators. Examples include The Future Unit, The Survival Unit, and The Crime Unit.

Baker, D., C. Semple, and T. Stead. *How Big Is the Moon? Whole Math in Action*. Portsmouth, NH: Heinemann, 1990.
While many of the project ideas focus on developing mathematical concepts, the organizing framework of selecting a topic; completing a project plan; collecting, processing, and interpreting information; and presenting acquired knowledge this book would assist any teacher in implementing project methods in the classroom.

Barell, J. *Problem-Based Learning: An Inquiry Approach*. Palatine, IL: ITI/Skylight, 1998.
The author outlines a variety of classroom situations and structures for teaching inquiry through problem-based scenarios. This book includes helpful descriptions of teacher modeling, questioning, responding to students, peer interactions, developing group inquiry skills, and using reflective journals to guide learning.

Bateman, W. L. *Open to Question: The Art of Teaching and Learning by Inquiry*. San Francisco: Jossey-Bass Publishers, 1990.
Bateman illustrates how he uses questions to challenge student assumptions, foster inquisitiveness, and probe the evidence presented. He uses classroom inquiry to examine habitual ways of thinking, to challenge stereotypes, and to help students question their own perceptions.

Brooks, J. G., and M. G. Brooks. *In Search of Understanding: The Case for Constructivist Classrooms*. Alexandria, VA: Association for Supervision and Curriculum Development, 1993.
A foundational and theoretical perspective on the need for active student learning in making meaning. This book outlines what "constructivist" teachers do.

Burns, R. C. *Dissolving the Boundaries: Planning for Curriculum Integration in Middle and Secondary Schools*. Charleston, WV: AEL, Inc., 1995.

This is a concise guide to the components of team-planned instruction and a range of curriculum approaches—multidisciplinary, interdisciplinary, integrated, and transdisciplinary.

Clarke, J. H., and R. M. Agne. *Interdisciplinary High School Teaching: Strategies for Integrated Learning*. Boston, MA: Allyn & Bacon, 1997.

This book shows how to frame a focusing question—and hook it to prior knowledge—in a way that gets students to explore "the facts" leading to the development of sound interpretations, meaning, inferences, and conclusions. A variety of inquiry-based learning projects at the secondary level are described in detail.

Cousins, E., and M. Rodgers, eds. *Fieldwork: An Expeditionary Learning Outward Bound Reader*. Vol. 1. Kendall/Hunt: Dubuque, IA, 1995.

Expeditionary learning project methods emphasize self-discovery, responsibility, overcoming obstacles, and solitude and reflection as important dimensions of the learning experience. This collection of essays illustrates these principles in action.

Daniels, H., and M. Bizar. *Methods That Matter: Six Structures for Best Practice Classrooms*. York, ME: Stenhouse, 1998.

This book explores the role of integrative units, small group activities, representing to learn, the classroom workshop, authentic experiences, and reflective assessments during more active instruction.

Eisenberg, M. B., and R. E. Berkowitz. *Information Problem-Solving: The Big Six Skills Approach to Library and Information Skills Instruction*. Norwood, NJ: Ablex Publishing, 1990.

The "Big Six" Skills Approach is widely taught as a library paper research process in many schools. Project planners often incorporate these steps when developing rubrics for assessing student reports.

Jett, C. C., and J. C. McKee. *Field Studies: Challenging School-to-Work Projects*. Wheaton, IL: Critical Skills Group Ltd, 1992.

Sections of this book describe in detail how to conduct a field study. Other sections suggest student- and teacher-planned studies that could be carried out in any high school or community college. The authors provide case examples and performance assessment techniques that may be used with the field study approach.

Jones, B. F., C. M. Rasmussen, and M. C. Moffit. *Real-Life Problem Solving: A Collaborative Approach to Interdisciplinary Learning*. Washington, DC: American Psychological Association, 1997.

This book includes well-developed examples of problem-based

learning in the areas of language arts and humanities, science and mathematics, and multicultural studies.

Katz, L. G., and S. Chard. *Engaging Children's Minds: The Project Approach*. Norwood, NJ: Ablex Press, 1989.
Two renowned early childhood educators explain the project approach. The emphasis is on driving student inquiry through student questions and interests.

Kinsley, C. W., and K. McPherson. *Enriching the Curriculum Through Service Learning*. Alexandria, VA: Association for Supervision and Curriculum Development, 1995.
Service learning is more than "volunteering" within the community. Service learning provides opportunities for students to apply skills learned in the classroom in a real-world context, or to learn from the experience itself.

Knapp, C. E. *Just Beyond the Classroom: Community Adventures for Interdisciplinary Learning*. Charleston, WV: AEL, Inc., 1996.
This book is a good source for ideas on community explorations and environmental investigations. Knapp's reflective questions make useful prompts for student inquiry.

Kobrin, D. *Beyond the Textbook: Teaching History Using Documents and Primary Sources*. Portsmouth, NH: Heinemann, 1996.
Instead of providing a single model for teachers to follow, Kobrin provides examples of what "students as historians" might look like in day-to-day classroom practice. He provides descriptions of classroom lessons, discussion topics, sample handouts, primary source materials, and excerpts from student writing.

Kovalik, S. *ITI: The Model*. Village of Oak Creek, AZ: Books for Educators, 1993.
The originator explains the components of integrated thematic instruction. The ITI approach is frequently adopted by elementary educators.

Levy, S. *Starting from Scratch: One Classroom Builds its Own Curriculum*. Portsmouth, NH: Heinemann, 1996.
Here are some outstanding examples from a fourth-grade classroom in Lexington, Massachusetts. Levy intersperses concrete examples of student-led inquiry with good advice about curriculum, elements of a good question, and the teacher's role.

Macrorie, K. *The I-Search Paper*. Rev. ed. Portsmouth, NH: Boynton-Cook, 1988.
Macrorie's I-Search process connects content and learners through guiding questions (my search question, my search plan, my learning, my conclusions, my next goals for learning).

Mitchell, R., M. Willis, and The Chicago Teachers Union Quest Center. *Learning in Overdrive: Designing Curriculum, Instruction, and Assessment from Standards*. Golden, CO: North American Press, 1995.

This book illustrates how project work—content, instruction, and assessment—can be built around standards, broken into learning sections, and lead up to a culminating task.

Passe, J. *When Students Choose Content: A Guide to Increasing Motivation, Autonomy, and Achievement*. Thousand Oaks, CA: Corwin Press, 1996.

The author provides examples from high school social studies and art classes, middle school mathematics, and grade one. He provides concise documentation on how education theory and research support the practice of students brainstorming topics, pruning the list, reaching consensus, identifying subthemes, and carrying out student-led investigations. Passe gives good counsel on communicating with administrators and parents, planning the initial lessons, concluding the unit, and documenting the work.

Raizen, S., P. Sellwood, R. Todd, and M. Vickers. *Technology Education in the Classroom: Understanding the Designed World*. San Francisco: Jossey-Bass, 1995.

If you can get only one book on the rationale for design and technology experiences in the curriculum, grades K-12, get this one. The vignettes and program profiles are excellent.

Richmond, G. H. *The Micro-society School: A Real World in Miniature*. New York: Harper & Row, 1973.

Here the concept of microsociety is explained by the person who "invented" it.

Springer, M. *Watershed: A Successful Voyage into Integrative Learning*. Columbus, OH: National Middle School Association, 1994.

Springer explains how two middle school teachers implement the project method through structured "expeditions" in their environment. Their organizing themes, procedures, time lines, and assessments of project-based learning are exceptional.

Stevenson, C., and J. F. Carr, eds. *Integrated Studies in the Middle Grades: Dancing Through Walls*. New York: Teachers College Press, 1993.

Teachers share outstanding examples of student- and teacher-planned projects.

Thomas, J. W., J. R. Mergendoller, and A. Michaelson. *Project-Based Learning: A Handbook for Middle and High School Teachers*. Novato, CA: The Buck Institute for Education, 1999.

This is a comprehensive planning guide to determining content, driving questions, teaching strategies, and assessments in project-based learning.

Torp, L., and S. Sage. *Problems as Possibilities: Problem-Based Learning for K-12 Education*. Alexandria, VA: Association for Supervision and Curriculum Development, 1998.

This is a well-crafted guide to teaching and learning through "ill-structured" problems. Students meet a problem, identify what they know and need to know, define the problem based on information available, gather and share additional information, generate possible solutions, determine a best-fit solution, present their proposal or recommendation, and debrief.

Walker, D. E. *Strategies for Teaching Differently: In the Block or Not*. Thousand Oaks, CA: Corwin Press, 1998.

Walker shares practical tips and cognitive organizers for promoting a positive classroom climate, building skills for teamwork, helping students make personal connections with ideas and exchange information, demonstrating understanding, and reflecting on one's own learning.

Wigginton, E. *Sometimes a Shining Moment: The Foxfire Experience*. New York: Anchor Books, 1986.

The founder of the Foxfire method leads readers on a reflective journey through his career. This guide is useful to both philosophy and practice.

Zemelman, S., H. Daniels, and A. Hyde. *Best Practice: New Standards for Teaching and Learning in America's Schools*. Portsmouth, NH: Heinemann Books, 1998.

This book reviews classroom strategies in schools that are student-centered, experiential, democratic, and collaborative, with descriptions of effective teaching in reading, writing, mathematics, science, social studies, and the arts.

Zorfass, J. M., with H. Copel. *Teaching Middle School Students to Be Active Researchers*. Alexandria, VA: Association for Supervision and Curriculum Development, 1998.

The authors present a four-phase approach to student project development that helps middle school students become active researchers. The planning and assessment criteria in the appendix are concrete and detailed.

Appendix A

The Six A's of Designing Projects

Authenticity

____1. The project emanates from a problem or question that has meaning to the student.

____2. This problem or question might actually be tackled by an adult at work or in the community.

____3. Students create or produce something that has personal or social value, beyond the school setting.

Academic Rigor

____1. The project leads students to acquire and apply knowledge central to one or more discipline or content areas.

____2. It challenges students to use methods of inquiry central to one or more disciplines (e.g., to think like a scientist).

____3. Students develop higher order thinking skills and habits of mind (searching for evidence, taking different perspectives, and the like).

Applied Learning

____1. Students solve a semi-structured problem (designing a product, improving a system, organizing an event) that is grounded in the context of life and work beyond the school walls.

____2. The project leads students to acquire and use competencies expected in high-performance work organizations (such as teamwork, appropriate use of technology, problem solving, communications).

____3. The work requires students to develop organizational and self-management skills.

Active Exploration

____1. Students spend significant amounts of time doing field-based work.

____2. The project requires students to engage in real investigation, using a variety of methods, media, and sources.

____3. Students are expected to communicate what they are learning through presentations.

Adult Connections

____1. Students have opportunities to meet and observe adults with relevant expertise and experience.

____2. The work of adults becomes more visible to students.

____3. Adults from outside the classroom help students develop a sense of the real-world standards for this type of work.

Assessment Practices

____1. Students have opportunities to review exemplars of similar work products.

____2. There are clear milestones or products at the completion of each distinct phase of the work, culminating in an exhibition, portfolio, or presentation.

____3. Students receive timely feedback on their works in progress and engage in periodic, structured, self-assessment using clear project criteria that they have helped to set.

This checklist was created by Adria Steinberg, program director, Jobs for the Future, and is reprinted with her permission. Another version of it appears in *Schooling for the Real World: The Essential Guide to Rigorous and Relevant Learning* by Adria Steinberg, Kathleen Cushman, and Robert Riordan; foreword by Theodore Sizer (San Francisco: Jossey-Bass Publishers, 1999).

Appendix B

Teachers' Sample Project Plans for Elementary, Middle, and High Schools

(with teachers' reflections on how the plans worked in their classrooms)

Second Graders Study Water

Author Information

Dot Schuler teaches second grade at Grafton Elementary School, Grafton, Illinois. She has written several publications on project-based learning and is a frequent contributor to the discussion list PROJECTS-L@postoffice.cso.uiuc.edu. A visit to her Web site at http://www.plantnet.com/dschuler will link you to other project descriptions.

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Background

On Thursday, March 12, 1998, second graders from Grafton, Illinois, at the confluence of the Mississippi and Illinois Rivers, began their six-week project by brainstorming and categorizing ideas about water and displaying the results on a graphic organizer. Letters were sent to parents encouraging their participation. Personal water stories were recorded and placed in the listening center, along with the continuous-roll "movie" box of illustrations portraying each child's story. Open-ended questions about water were posed by the teacher and responded to by pairs of children, rotating from question to question, giving all children a chance to

write down ideas about each question. Children then published the responses on charts for reference throughout the project.

Learning Goals and Standards

Throughout the project, the application of curricular skills abounded, some occurring naturally during their small-group investigations, and some taught systematically for assignments completed at learning centers. In the reading center, several charts about water were made after systematic instruction of new curricular reading skills: suffixes, fact-and-fiction, and cause-and-effect. Two class books were written and compiled: one using alliteration and one containing descriptive essays. Three class math books were made: two-step story problems, number words, and fractions, all of which were related to water. Persuasive essays were written and displayed in the hall. Often, spelling words were taken from project work.

Throughout the project, the application of curricular skills abounded....

Introducing the Project

Many children brought in water samples for observation and testing. Liquid measuring scales, measuring containers, test tubes, thermometers, litmus paper, microscopes, pipettes, and other science materials were used for making discoveries, which were recorded in learning journals. Discoveries, such as the example below, were shared at group meetings.

> **Valerie:** "I discovered that 43 ml. of water, add 1 rock crystal, it goes to 45 ml. Then 45 ml. add 1 more rock, it goes to 49 ml. Also, 33 ml. add a dinosaur counter (from math) you get 38 ml."
>
> **Phil:** "I discovered something about the funnel. If you put just a little water, it just goes through, but if you put a lot, maybe half, it makes a mini-tornado."

Project Activities

Time Line: March 27-May 26

Community Connections

On March 27, 1998, we walked to the local water park, where the manager showed us each attraction and explained the construction, water capacity, cleaning process for opening day, and other interesting facts. Many of the children swim there during the summer but had never had the opportunity to explore the park

while empty. After ample time for students to sketch and take notes, we picnicked in the adjacent park before our walk back to school.

Later that week we took another local walk to the Grafton Water Works, where we took notes as the manager explained the process by which our water is pumped from an aquifer (underground river) and carried by pipes to the mixing bowl, settling tank, and filter.

Our Environmental Educator visited our classroom to teach about the three states of water (liquid, solid, gas) and the sources of water on earth. Afterward, we went outside for an experiment that made clearer to the children the availability of water in each of the sources. On Thursday, April 2, the Environmental Educator took us by bus to visit the Alton Lock-and-Dam system on the Mississippi River, about 10 miles from the school. A member of the Corps of Engineers was our guide at the dam. Then, in the adjacent wetland area, we used binoculars to observe pelicans. We then walked to the bank of the river to collect mud samples in sieves and look for wildlife.

A park ranger from the nearby state park came to the classroom on Friday, April 3. He talked about various river-related topics and natural resources. After answering the children's questions, he distributed many handouts and posters.

Children continually posed possible topics for investigations.

- What is the history of the Mississippi River?
- What can I learn about sharks, manatees, dolphins, sea horses, and whales?
- How does dirty water get clean?
- What can I learn about water pollution?
- What are the colors of water?
- What happens to food when it is placed in water?
- I want to learn about all of the pools at Raging Rivers (a local water park).
- I want to learn about river otters.
- How does water work?

The reading center and the computer were used for research, and we had discussions to share our findings.

Teacher-led Activities and Group Discussions

The reading center and the computer were used for research, and we had discussions to share our findings.

Bethany: "Even though I don't need to read for my experiment, I read with Kylie and took notes. I read in this fish book that fish have gills, and a dolphin is a fish."

Mrs. Schuler: "But, is a dolphin a fish?"

Stephanie (who is studying about dolphins): "No."
Mrs. Schuler: "Are their babies born live?"
Stephanie: "Yes."
Mrs. Schuler: "Carley [who is studying about whales], is a dolphin in the whale family?"
Carley: "Yes. And they breathe on top of the water."
Bethany: "But wait, Mrs. Schuler, look at this picture. It doesn't look anything like a dolphin. Maybe there's a fish called a dolphin, too."
Mrs. Schuler (who hadn't even thought of that and had, in fact, just commented that maybe we should write a letter to the publisher of that fish book): "Bethany, maybe you're on to something there. Stephanie, could you try to find out in the reading center today?"

Team Investigations and Individual Activities

On Monday, April 6, we began our investigations. Several children chose to study ocean creatures, converting the sizes of models from feet to inches. Others were studying river wildlife, making their models and paintings actual size. Another group began working on a model of the Water Works building, so that they could show the steps involved in making our drinking water clean. Still another group wanted to interview teachers in our building, to ask how water works in their rooms, then make a model of the school building for displaying their information. Samantha began studying pollution, covering our "bulletin board river" with samples of litter and planning a pollution walk around our community. Bethany began an experiment on the effect of water on foods. Katie experimented with and interviewed people about the color of water. Kate began making a model of the wave pool at Raging Rivers Water Park. Cody created a double filter machine, with water going first through a sand filter, transferred through straw pipes, and strained by a second strainer before pouring into a container.

Daily journal entries were often about their investigations and, as they were shared at group meetings, discussions were very interesting.

Monitoring Student Work

As investigations progressed, many children wrote poetry, songs, idioms, and comic strips about water. Daily journal entries were often about their investigations and, as they were shared at group meetings, discussions were very interesting. Group meetings were also used to share progress on investigations and representations, with children offering encouragement, comments, and suggestions.

The children studying ocean creatures decided to display their models in a large "aquarium" made from boxes. They began thinking of ways to represent their knowledge for all to see. To tell about the manatee and dolphin models, books were written. For the whale and shark models, posters were made.

The children studying river wildlife decided to hang a plastic see-through mural in front of the "polluted" bulletin board. A poster telling about the pollution in the river was on display in the front of the mural. Models of a turtle, otter, and 13-foot catfish were in the river (hanging from the ceiling behind the mural). Various kinds of river fish were painted on the mural. On the riverbank stood a blue heron and a sycamore tree. Under the sycamore tree in a nest was a female red-winged blackbird sitting on her eggs as a male blackbird flew overhead. The children decided to type information about the wildlife on the computer and print it out for others to read. That way, there would be no signs or posters in the river and it would look more realistic.

The children building the Water Works decided to connect it to the model building of the school with real pipes that one of the boys had brought from home (his father is a plumber). They also created a filter, with layers of anthracite (they used charcoal), rocks, and sand. A container was placed in the "school building" to catch the "clean" water, which actually ran from the filter through the pipes.

On May 4, we rode by bus to a creek in Elsah, Illinois. (about eight miles away from the school), to study water, water plants, and wildlife, and to look for fossils and geodes. We then went to the pond at Mrs. Schuler's house for a picnic, followed by fishing, casting molds of animal tracks, and sifting through mud to find pond life. As with each trip, upon return to the classroom, we had a group meeting to share our sketches and notes, documenting all notes on charts that were displayed in the room for reference.

As with each trip, upon return to the classroom, we had a group meeting to share our sketches and notes, documenting all notes on charts that were displayed in the room for reference.

Assessing Student Learning

Schuler's Scholars Water Project culminated on Tuesday, May 26, 1998. That morning, after Samantha explained the rules of her planned excursion, we walked around our community carrying plastic bags and wearing rubber gloves, picking up litter that would potentially pollute the river. Then we cooperatively prepared our room for the celebration of knowledge that evening.

At 6:30 p.m., we gathered in the school cafeteria for refreshments, introductions to our experts and visitors, and water songs written and performed by the second graders. Then, our crowd of

about 60 people went upstairs to our classroom to view the students' products, including the "Waterfall Aquarium," "River-With-Many Animals," "Experiment Table," "The Raging Rivers Exhibit," "The Water-Works-When-the-Water Works," and the computer movie of poems written by the children. Using their printed river guide, visitors read the information about all of the fish, the turtle, otter, blue heron, red-winged blackbirds, and the sycamore tree. In addition, a book about turtles was on display, as well as a book about otters. A bar graph revealed the answers to a survey about the longevity of turtles and the number of eggs they lay. Another bar graph represented interview results about the color of water. A Venn diagram compared a person to a red-winged blackbird. The "Water Works building" displayed a flow chart explaining how our water is cleaned and a diagram showing the layers of the filter. The "school building" had signs hanging from the windows telling how water works in each classroom.

Project work had definitely been the highlight of our year and we were proud, but sad, to see it end.

At the experiment table, many guests watched as various people experimented with water. Others viewed the chart that showed how water had increased the size and weights of some foods. Another experiment explained how chemicals get into our groundwater supply. Models of Raging Rivers Water Park attractions were on display, accompanied by information signs. The aquarium contained a hump-backed whale, dolphin, manatee, and basking shark suspended from the ceiling, creating the effect of slow movement when the fans were on. Each model was accompanied by a book or poster representing knowledge gained during the investigation. A Venn diagram compared humans to sharks; another diagram with labels represented the inside of a shark. A survey about the size of sea horses was explained by a pictograph. Plastic see-through murals with a colorful coral reef painted on them covered the sides of the aquarium, creating the effect of real water. Sand and three-dimensional models of numerous species of coral adorned the bottom of the aquarium.

Teacher Reflection

Project work had definitely been the highlight of our year and we were proud, but sad, to see it end. On the last day of school, we watched segments of our projects on videotape and reflected on our work. The children are now looking forward to next year, when they can visit my new group of students and tell them about project work. They are now the experts on studying a topic in depth!

When Students Plan Projects

Author Information

Susie Girardin has taught at the middle school level for 25 years in Vermont. She recently began consulting full time to many schools throughout the northeast. Her work also involves several research projects, a graduate program, mentoring college students, and a book proposal. Susan lives with her son and teacher-husband in northern Vermont.

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Background

As part of learning about other cultures, students had been participating in a poetry exchange with pen pals in Puerto Rico for about one and a half years (we are a multi-age school). Students asked if we could have one of our pen pal groups come for a visit during the project's second year. Students planned many of the study trips for the weeklong visit (skiing, snow boarding, sugaring, State House with Governor Dean, Montreal, etc.). My partner and I handled many of the logistics such as money, transportation, and housing, but the kids communicated with one another through letters, poems, and videos.

Students used the Vermont Framework to shape the curriculum

Learning Goals and Standards

Students used the Vermont Framework to shape the curriculum: cultures, collaboration, geography, planning/organizing, and so forth. They developed curriculum and assessments for the weeks preceding the visit that allowed them to learn more about Puerto Rico.

Introducing the Project

Our team began by exchanging poetry with several cultures to better understand children's lives outside of New England. The San Juan students in Teresita Santiago's English as a Second Language class were faithful in corresponding with us. Our stu-

dents continued writing as pen pals. We exchanged foods, photographs, videotapes, and news about hurricanes or blizzards.

Project Time Line and Activities for Pen Pal Exchange

March 21 - 27

Before and after the weeklong visit from Puerto Rico students, our Vermont students studied Spanish, Puerto Rico's geography and history, and culture. They exchanged poems with pen pals, conducted research, completed a quilt highlighting Vermont and Puerto Rico similarities, and planned fund-raising activities to support the exchange.

Sunday, 3/21

1. Pick up guest(s) at Burlington International Airport.
2. Bring outdoor clothing if necessary.

Monday, 3/22

- Students and guests arrive via regular buses or by family car before 8:00 a.m.
- Everyone arrives with a bag lunch and appropriate outdoor clothing, bringing sledding equipment.
- Welcome and orientation with Mr. Goudreau, principal, in cafeteria, 8:10 to 8:45 a.m.
- "Getting to know you" activity in small groups, snacks provided.
- 9:30 a.m. Proctor Research Maple Center in Underhill: tour, lunch, sledding, (or return to CHMS for movie), return by 1:30 p.m. for dismissal.

Tuesday, 3/23

- Students and chaperones arrive at CHMS by 6:15 a.m., buses depart promptly at 6:30 a.m. for Montreal.
- Students and adults must have a copy of birth certificate with them.
- Bring a bag lunch (there is a snack bar in Botanical Gardens).
- We will leave by 1:15 p.m., to arrive CHMS by 4:00 p.m. for pick ups (we will radio school should there be major delays).

Wednesday, 3/24

- Depart from CHMS at 8:00 a.m. for Montpelier.
- Bring bag lunch.
- Everyone should be dressed appropriately to meet the governor.

- One home room will visit the Historical Society while other home room will get a tour of the State House; we will all meet the governor between tours.
- Return to CHMS by 2:00 p.m. for dismissal.

Thursday, 3/25

- Arrive at CHMS by 8:00 a.m. with outdoor gear for Smugglers, bring a bag lunch.
- Depart for Jeffersonville at 8:30 a.m. for Smuggler's Notch.
- Groups split into pre-chosen sport activity for instruction and play.
- Arrive CHMS for regular dismissal by 2:00 p.m.
- Family Dinner Night in CHMS cafeteria at 6:00 p.m. (buffet dinner, quilt presentation).

Friday, 3/26

- Leave CHMS at 8:15 a.m. for University of Vermont, buffet lunch provided by UVM.
- Students and chaperones will have been divided into four groups to do the day's activities: Art Museum, physics demo, Geology Museum, farm tour.
- Buffet lunch, student panel, athletics facility tour.
- Arrive CHMS at 2:00 p.m. for dismissal.

Saturday, 3/27

- Host families bring guests to Swiss Chalet in Williston (right off I-89) any time during the day.

Assessing Student Learning

We used student-designed rubrics and scoring guides based on criteria from Vermont Learning Standards. Kids did reflective pieces of writing as well as used the state's portfolio assessments for their poetry. They were quizzed and tested on material from geography, history, and Spanish.

On the next page is the scoring guide for the quilt.

We used student-designed rubrics and scoring guides based on criteria from Vermont Learning Standards.

Appendix B

Individual Scoring Guide for Group Quilting Activity

Puerto Rico Quilt Rubric	1	2	3	4
Group Cooperation	• Slacker • No contributions • Argues • Puts down others • More than two reminders • Criticizes	• Two reminders • Sidetracks group • Sometimes contributes • Quiet at times • Bossy sometimes	• Contributes frequently • Spends time wisely • Journal filled out • Shares tasks • One reminder • Encourages	• No reminders • Gives compliments • Keeps all work • Always on track
Quality of Products	• Sloppy • Not recognizable • No detail • No meaning	• Loose stitches • Inappropriate color • Late • Meaning unclear • Too big, too small	• Neat stitching • Done on time • Clearly recognizable • Can see connection • Detailing • Appropriate size	• Extensive, clear details • Professionally sewn • Unique match to other symbols
Understanding of Purpose and Material	• Can't explain purpose • Doesn't understand material • Can't compare or contrast Vermont to Puerto Rico	• Can explain most of purpose • Understands many facts, symbols • Can compare or contrast, not both	• Clearly understands quilt purpose • Can explain symbols • Can compare and contrast Vermont and Puerto Rico	• Connects material to other subjects • Uses information to create new meaning
Does Research and Homework	• Doesn't do assignment • No effort to research	• Misses one assignment • Researches one idea	• Does each assignment • Finds appropriate information each time	• Does research outside of class • Brings in other supplies
Written Evaluation:				

Teacher Reflection

The project's value continued to grow as we reflected on the project weeks later. On a larger scale, lifelong friendships were formed and the governors of Vermont and Puerto Rico renewed their contact. As teachers, we affirmed our belief in the power of students owning their learning and being self-directed. However, it was difficult to coordinate a smoothly running time schedule for our week together.

America: A Nation of Immigrants

Author Information:

Charles Jervis (biology), Steve Bull (history), and Jerry Sauter (English) teach on a high school interdisciplinary team. They have used interdisciplinary projects and units with performance-based assessments since 1992.

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Background

Our team saw a need to give students opportunities to identify contributions of various ethnic groups to American culture. For us, this was an opportunity to link world history, world literature, and science into a unified project with a global perspective. The project grew out of an earlier schoolwide global studies unit and model United Nations project.

For us, this was an opportunity to link world history, world literature, and science into a unified project with a global perspective.

Learning Goals and Standards

In addition to gaining knowledge of the contributions of various ethnic groups to American culture, students develop skills in researching and interviewing, presenting information, cooperative learning, resource management, and interpersonal communications. Students make links between historical, literary, and scientific perspectives and meet Virginia Standards of Learning in history, English, and biology.

Students make links between historical, literary, and scientific perspectives and meet Virginia Standards of Learning in history, English, and biology.

Introducing the Project

The teaching team assigns tasks in literature, history, and science classes and identifies questions to guide the project.

- What evidence is there that immigration is a periodic phenomenon and a recurring event in history?
- How have various factors contributed to immigration events throughout history?
- What have been the effects of immigration on development of American culture?

We point out some general concepts and general connections.

- historical and literary contributions of immigrants
- historical patterns of immigration
- types of immigration (forced, voluntary)
- science related to immigrants or immigration (e.g., eugenics, individual contributions to science)
- stereotypes
- in groups/out groups
- cultural pluralism
- immigration laws
- attitudes of established culture toward newcomers
- patterns and causes of immigration

We present students with options and allow them to self-select topics and working groups.

- Show immigrant contributions to or influences on the U.S.A.
- Describe the treatment of specific immigrant groups.
- Describe the Triangle Trade.
- Research spiritual beliefs of a specific cultural group.
- Describe the impact of scientific discoveries and technologies on immigration. (We have 27 in the current list.)

Project Activities

Teacher-led Activities

- Gather relevant literature.
- Introduce relevant concepts and content.
- Monitor writing/response journals and provide feedback.
- Lead reading and discussion of materials.

Sample literary selections include the following.

"Wulam Olum" (American Indian creation myth, Delaware tribe)
"Big Eater's Wife" (American Indian story, Penguin tradition)
"Journey to the Skeleton House" (American Indian story, Hopi tradition)
"Scars of Autumn" (essay by Yoshiko Uchida)
"Fish Cheeks" (essay by Amy Tan)
Short stories by Sandra Cisneros
"Hunger of Memory" (excerpt from essay by Richard Rodriguez)
"Little Things Are Big" (essay by Jesus Colon)
"A Delicate Balance" (story by Joe Arroyo)
Picture Bride film, Director Kayo Hatta)

Group Discussions

- Respond to literature readings.
- Explore historical topics (among others: first Americans, European discoveries, Spanish and English influences, colonial attitudes/regions, immigration laws and policies).
- Consider genetics and immigration (e.g., diversity, genotype shifts).

Individual Student Activities

- Read relevant materials.
- Research interdisciplinary perspectives (economic, historical, literary, scientific, etc.) on a selected teacher-approved immigration topic.
- Reflect on readings and writings in journals and class discussions.
- Present understandings as individuals and groups through portfolios and oral reports.

Team Investigations

- Compile relevant factual information.
- Develop portfolio of products that illustrate or explain the selected topic.
- Present understanding of team topic in an oral report.
- Defend products.
- Revise as needed.

Community Connections

- Interview international students at Radford University and Virginia Tech, and naturalized citizens in the community.
- Get technical assistance with product development.
- Invite guest speakers.

Time Line/Week One

- Introduce project.
- Select topics and groups.
- Review criteria and rubrics for products and presentations.

Weeks Two and Three

- Read and discuss literary selections.
- Begin research on selected topic.
- Outline three products to be developed.

Week Four

- Continue research and complete products.

Week Five

- Present an oral report that explains what topic was investigated and how the three products demonstrate understanding of the topic.
- Respond to questions posed by students and teachers.

Week Six

- Reflect, revise, and resubmit product, if desired.

Throughout, content-specific material is covered in class activities (lectures, films, readings, discussions, questions and answers, library research, tests, quizzes, writing journals, response journals).

Monitoring Student Work

We use writing journals, discussions, tests, quizzes. We monitor small group product development, discuss rubrics, and display benchmarks.

Assessing Student Learning

We have a portfolio of possible products from which students may choose:

brochure
chart
diorama
display
graphs
interviews
newspaper accounts
poetry
propaganda tools
survey polls
videotapes
skits

Each group or individual must develop three products for a *portfolio*, which they must *defend* in an oral *presentation* of their understanding of the topic. Students take tests and quizzes on some content-specific material.

Each group or individual must develop three products for a portfolio, which they must defend in an oral presentation of their understanding of the topic.

A group of teachers assesses each product with shared rubrics; entire student assessment is a group assessment (by a group of teachers). When possible, each presentation/defense is before the class and two or more teachers.

There is a separate rubric for each type of product. The project grade is based upon all three products and the presentation. Here is the rubric for one sample product.

Newspaper Account Rubric

It must be written in proper newspaper form. A clear theme must be evident throughout the account. Graphics and photographs should be used to enhance the product. Text and graphics should be balanced. A variation of type styles should be used to highlight the main topics. Unique and appropriate stock should be used. It should be free of grammatical errors. Audience should be considered and addressed throughout. All written material must be student originals.

Expert Level: Meets or exceeds all the criteria.

Acceptable Level: Meets criteria but weaknesses are apparent in unity, analysis, or communication.

Needs Revision: Product is weak in several of the areas and suggested revisions need to be made in the time period stated.

No Credit: Revisions are not completed. For each level, students have an opportunity to revise their work to score at a higher level. Usually, they have one week from the time the feedback is given to submit revisions.

Teacher Reflection

We believe that the project method is worthwhile because students gain understanding of content knowledge and skills in group interactions and group development. This means that students get firsthand experience in interacting in groups. They learn that they must reach compromise and consensus in some areas, that they must share resources and time schedules, that it is efficient to divide labor and use each others' strengths. Overall, they learn meaningful ways to work interactively with others on long-term projects.

We believe that the project method is worthwhile because students gain understanding of content knowledge and skills in group interactions and group development.

Students also save time and receive multiple credits. They can work on one project and receive credit in three (sometimes more) classes. Since cooperative group work is used, they can divide the labor based upon strengths or interests of the group members, and bring it together in the defense.

On some topics in some projects, we need to strengthen science and mathematics connections, talk with language teachers or art teachers about credits there, bring in more vocational possibilities, look for more authentic audiences, and so forth. There is lots of growing to do. We'd also like to get more involved in linking student work with external research opportunities.

Because of scheduling, it is not always possible to do group assessments of presentations. Over the years, our schedule has worked out from time to time so that all three of us can assess a presentation together, but that has been rare. Usually at least two can be present for most of the presentations. We do communicate well, and we do meet together and assess products. If one says that there were particular strengths or weaknesses about a presentation, we rely on that judgment. We look at each product and the portfolios in association with the presentation (Do they all display understanding? Do they fit the intent of the topic? Did the students understand them? Do they meet stated criteria?).

To Make a Difference

Author Information

She was in the first ninth-grade core team at John Rogers High School and was instrumental in restructuring the entire ninth grade into interdisciplinary teams. She and her team members are working on an American Studies block. They have been awarded a Community-Based Service Learning Grant to complete an American Heritage project with eleventh grade students. This grant enabled them to complete the To Make A Difference project with the ninth grade in each of the past three years.

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Background

Our ninth grade core team wanted a project that would combine community service and technology, and would also connect to district-mandated curriculum and state and district learning goals. We wanted students to work collaboratively to research, process, produce, and demonstrate their learning.

We wanted students to work collaboratively to research, process, produce, and demonstrate their learning.

Learning Goals and Standards

Students learn time management and improve critical thinking, collaboration, and decision making. They learn to collaborate in all stages of project completion—assuming roles and assigning tasks. Their interpersonal skills are enhanced during their group work and as they work with mentors and contact resources in the community. Intrapersonal skills are strengthened with reflective journals and learning logs. Students also learn speaking and technology skills necessary for multimedia presentations to community leaders. They learn to use community resources along with traditional research avenues. They develop a new awareness of community issues and the role of citizens in decision making.

Reading and writing skills are targeted during nearly every phase of the project. (Improvement in reading scores from fall to spring in our ninth grade core team was nearly double that of the control group.)

Improvement in reading scores from fall to spring in our ninth grade core team was nearly double that of the control group.

Introducing the Project

We tell students about the To Make A Difference contest, which is sponsored by The Citizen's League of Spokane, and ask if they would like to be a part of it. We then let them brainstorm community issues individually in journals and in class discussions and small groups. We read about student "heroes" who take on projects in other cities and indeed make a difference in their communities. Once their projects are chosen, students write letters, make phone calls, and send e-mail as part of their research. They also make personal visits to acquire information and to perform services at various community agencies related to their issues. Many meet frequently with mentors. It is their responsibility to make the appointments and follow through.

Project Activities

Teacher-led Activities

- Facilitate brainstorming.
- Instruct writing, research, speaking, and technology skills and procedures.
- Conduct formal assessment.

Individual Student Assignments

- Keep daily reflective journals.
- Write letters of request and thanks.
- Conduct self-assessment, group, and project evaluation.
- Write a reflection paper.
- Do tasks related to research and presentation as decided by the group.

Team Investigations

- Conduct initial brainstorming about specific problem.
- Assign roles and individual tasks for research.
- Visit relevant agencies.
- Hold investigative meetings with mentors and community leaders.

Community Connections

- Northeast Community Center provides a list of possible mentors and agencies for groups to contact.
- The To Make A Difference contest provides an authentic forum for results of students' work.
- Each group's portfolio of research and solutions is evaluated by community leaders. The top three groups in the city then present orally to a panel of government and education officials. Two of our teams were in the top three (first and third).

Time Line

Weeks One and Two

- Present and discuss To Make a Difference idea.
- Brainstorm community issues.
- Choose groups and projects.
- Explore group dynamics and roles.
- Develop scoring guide.
- Keep daily reflection journal and learning log.

Week Three

- Read nonfiction.
- Practice taking notes, outlining, citing references, and using parenthetical references.
- Practice phone etiquette and technique.
- Continue reflection journals and learning logs.

Weeks Four and Five

- Conduct research in library and on-line.
- Write, phone, and e-mail agencies and community leaders.
- Refine thesis, outline history of the problem, and brainstorm solutions.
- Meet with mentors.

Weeks Five and Six

- Make site visits for research and service activities.
- Conduct research as need arises.
- Review writing process.
- Refine thesis, write history of the problem, and refine solutions.
- Meet with mentors.

Weeks Six and Seven

- Write summary of solutions and abstract.
- Prepare PowerPoint presentation.
- Learn and practice oral presentation skills.
- Revise history and solutions.

Weeks Seven and Eight

- Write individual reflection papers.
- Organize projects in portfolio.
- Give PowerPoint Presentations.
- Write thank-you notes to mentors and community agencies.
- Complete assessments of self, peer, group, and project.
- Celebrate!

Monitoring Student Work

Student work is monitored through reflective journals; learning logs; meetings with groups; class discussions; review of first drafts; and practice activities for reading, note-taking, outlining, citing sources, and completing various stages of the writing process.

Assessing Student Learning

The project scoring guide is used by the teacher to assess the student's PowerPoint project presentation. The criteria are developed and shared with students during week one of the project. In addition to teacher assessment, students are required to complete self- and peer assessment of their participation in the project. Both of these forms are included on the following pages.

Teacher Reflection

Student awareness of citizenship and community resources increased significantly. Student reading scores increased more than those in the other core teams. Whether this was a direct result of the project, teaching methods, or greater opportunity using specific reading strategies is difficult to ascertain. Certainly, our core students participated in the research process to a greater extent than they might have with traditional research assignments.

The emphasis on questioning was challenging to our students. Next time we would like to strengthen the mentor-student relationship. Students needed a push to make the necessary contacts and follow up. This was the third year of the project. The first two years, instructors played a more integral role in connecting students to mentors. I believe that worked better. Some groups never

got around to their visits and didn't maintain contact with the mentors. A regular schedule of contacts works better.

We continue to look at ways to motivate students in the areas of time management and self-evaluation. Many look for the easy way out and would prefer that teachers control every step in the process rather than facilitating. Overall, it is a worthwhile project that challenges students to make connections between academic, social, and political systems.

Appendix B

Project Scoring Guide for PowerPoint Presentation

OUTSTANDING	SUCCESSFUL	UNSUCCESSFUL
DESIGN:		
• Layout enhances message • Uncluttered • Draws viewer attention to most important points • Clip art, colors, fonts, style carefully chosen to enhance communication	• Layout delivers message with minimum distraction • Important points highlighted somewhat • Some effort at selecting appropriate art, color, fonts, style, etc.	• Layout detracts from message • Cluttered appearance • Key points difficult to find • Graphic features (color, art, fonts, style, artwork) seem to be chosen randomly or are poorly planned or incorporated.
CONTENT:		
• Goes beyond required questions • Answers all questions and explores new questions • Presents and expands on key concepts	• Answers questions as required • Presents but doesn't expand upon key concepts • Information is accurate	• Some questions unanswered • Missing key concepts • Some information is inaccurate
DELIVERY:		
• Presentation enlivened with supplementary information • Able to answer relevant questions posed by audience • Speaks knowledgeably/ confidently about sources and content • Polished/articulate • Not reliant on notes	• Able to answer most questions posed by audience • Somewhat knowledgeable about sources and content • Sometimes refers to notes • Delivery is personable	• Distractive mannerisms • Uses cliches or "space fillers" • Unable to answer questions • Is not knowledgeable about sources or content • Appears ill-prepared

Self-/Peer Evaluation

Instructions: Using a scale of 1-5, rate yourself on each of the items below. A score of 5 would be perfect.

Your Name: _____

- I completed my share of the work on the project. _____
- I asked for assistance when I needed it. _____
- I worked cooperatively with my partners. _____
- I shared in the planning of the project with my partners. _____
- I put a great deal of effort into researching the project. _____
- I put a great deal of effort into writing the paper. _____
- I put a great deal of effort into preparing my presentation. _____

Total _____

Now, rate your partners on each of the same items using the same scale of 1-5. A score of 5 would be perfect.

Partners' Names: (1)_____

(2)_____

	(1)	(2)
• He/she completed his/her share of the work on the project.	_____	_____
• He/she asked for assistance when he/she needed it.	_____	_____
• He/she worked cooperatively with me.	_____	_____
• He/she shared in the planning of the project with me.	_____	_____
• He/she put a great deal of effort into researching the project.	_____	_____
• He/she put a great deal of effort into writing the paper.	_____	_____
• He/she put a great deal of effort into preparing the presentation.	_____	_____
Total	_____	_____

Family Heritage Project: Connecting to Our Roots

Author Information

Regina Headden currently teaches U.S. history, anthropology, and psychology. She has a 21st Century classroom that includes 15 student computer workstations and a teacher workstation. Regina and another Central High teacher have written and received more than $120,000 in grants in the past three years.

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This project addresses many objectives and standards in the Tennessee U.S. history curriculum framework.

Background

My U.S. history students complete a family heritage project each semester. (Our school is on a 4 x 4 block schedule.) This project aims to get students involved more with their local roots and to help them see how their families progressed along with our nation.

Learning Goals and Standards

This project addresses many objectives and standards in the Tennessee U.S. history curriculum framework. I especially try to tie it in with immigration and the world wars. The students are able to place events in the lives of their family members and ancestors in the context of the events being studied in class. They begin to connect to the nation's history because they see that their family is connected to the nation's history. For example: A couple of years ago, we were studying WWII and were watching the Pearl Harbor scene of the movie *Tora, Tora, Tora*. The characters in the movie were talking about the *USS Lexington*. As soon as the *Lexington* was mentioned, a hand shot into the air. As I looked to see whose hand was waving frantically, a voice spoke out with pride, "Ms. Headden, Ms. Headden, that's the boat my grandpa was on!" Had the student watched this movie without having researched his family history, that one line in the movie would have slipped by without a notice.Students also learn several skills from completing this project. They love using the digital cameras. I have two that

The students are able to place events in the lives of their family members and ancestors in the context of the events being studied in class.

they may check out. They learn interviewing skills as well. I have 21 interview kits that they may check out. They also love to use the scanners. By the time the final project is complete, they have used computers, digital cameras, scanners, binding machines, tape recorders, and other technology.

Introducing the Project

I introduce the project in the first week of a semester. Most students know a little about the project from older siblings and friends who have participated during the past two years.

I ask students how they feel about history and how their history classes were in elementary. The usual answer is "boring." I acknowledge that certain aspects of history are boring, then I tell them that if they could see history as their ancestors experienced it, then history might not be so boring. I tell them stories about my ancestors—funny, sad, and embarrassing. I ask if anyone knows any stories about their own families they would like to share.

Students learn that their parents are great sources of information.

When the stories are finished, I pass out a list of the components from last semester's project. We talk about each one. I ask students if they have any suggestions or thoughts about the components. They take the list home and jot down ideas to turn in the next day. On several occasions, I have taken some of their ideas and included them in the project components.

Students learn that their parents are great sources of information. One girl talked to me about information she had found the night before. She said, "My parents and I sat down last night and talked. We actually talked. For the first time in years we talked and no one yelled at anyone else. This is so exciting."

Project Activities

Teacher-led Activities

- Introduction of the project as described above.
- Proper ways to do a pedigree chart. One major component of the project is the pedigree chart. The final version must be completed using Family Origins software. Long before I demonstrate the software, I want the students to see what a pedigree chart is like. I hand out blank forms and explain what it is. I explain about generations, maiden names, etc. Students nearly panic when they realize they must have a minimum of four generations represented. We complete the first three generations in class as we fill in the chart. Students start with

themselves, then their parents, then their grandparents. This helps them see that they know more than they thought they did.

- Introduction of the Family Origins software. I ask for a volunteer to sit at my portable workstation to begin their pedigree chart. With my 37" monitor on, other students gather around as I talk the student through the steps of completing the chart. Once that student has his/her basic information entered, I now have a helper to get the rest of the class familiar with the software.
- Two weeks (or longer) before each component is due, I plan some kind of activity that will get the students thinking and working ahead.

Individual Student Activities

Students usually get 30 minutes of class time once or twice a week to work on their projects. Many students still do not have access to a computer outside the classroom, so I provide an opportunity for them (I have 16 computers, 2 scanners, 2 printers, and 2 digital cameras in my classroom). I also have open lab from 7:00 - 8:30 a.m. and from 3:30 - 5:00 p.m. almost every day.

Individual Student Assignments

The assignments are given out a couple of days after I introduce the project. The students get a brochure with a rubric and time line for turning in assignments. They may work ahead as much as they like (and most often do).

As they proceed with their projects, they begin to realize that living in a small rural area is not so bad after all.

Team Investigations

Since this is mostly an individual project, there is really not any "team investigation" that takes place. However, students do work together in helping each other with their word processing skills; software questions; and using scanners, cameras, etc.

Community Connections

The majority of my students are natives of Morgan County. Some have never been more than 100 miles from home. Several students are direct descendants of the first settlers of the county. As they proceed with their projects, they begin to realize that living in a small rural area is not so bad after all. This project has led students to design other projects. For example, one student recently developed a Web page for her church's 120th anniversary.

Monitoring Student Work

Of course, observations as the students are working help me to see they are learning. Class discussions are beneficial as well. Having weekly deadlines for specific components of the project helps to determine if students are learning. However, the best tool I have found is the 30 minutes of class time allowed once or twice a week as the students become self-directed learners. When I see them helping each other, I see learning taking place. Also, as they work together, they begin talking about what they have found out about their families.

When I see them helping each other, I see learning taking place.

Students receive individual grades on the components and an overall grade on the finished project. They know they can always redo a component and try for a better final grade. This helps them see that a project can be a continuing one—it does not have to have an absolute end to it.

Assessing Student Learning

The rubric I developed is an excellent way for me and the students to know exactly what is expected with each component of the project and helps determine the letter grade for that component.

Students are given a rubric that defines the qualities (or letter grade) of the work they complete. They know what must be completed for an A, B, or C. They also know that they get individual grades on each component that account for 25 percent of the nine weeks' grade. They also know that they will receive a final project grade that accounts for 25 percent of the final U.S. History grade. If the students do poorly on a component of the project, they have the opportunity to redo that component before the final project deadline. This way, the final project grade can be raised despite the individual component grades. Students who want an A for the overall project must go an extra step and do a class presentation at the end of the semester. They usually prepare a PowerPoint presentation or create a Web site.

The rubric I developed is an excellent way for me and the students to know exactly what is expected with each component of the project and helps determine the letter grade for that component.

Please visit our Web site at

http://sun2.central-hs.morgan.k12.tn.us/wchs/project/family.htm

to view the project rubric and other details of the Family Heritage project.

Teacher Reflection

A 98 percent completion rate was more than I ever imagined.

Before I started using this project, I assigned a traditional research paper. I was lucky to get 75 percent of my students to complete the paper. The failure rates were high. In the four semesters that the Family Heritage Project has been in place, three students out of more than 200 did not complete a project—but they will before they graduate! A 98 percent completion rate was more than I ever imagined. This project is valuable in that it not only helps students connect their families to events in America's history, but it also gets them in touch with their immediate families. The reaction of parents to this project is so positive. I have received notes, phone calls, and visits from parents who were thrilled with this project and wanted more information. The project seems to work well. I have changed components each semester (so siblings cannot turn in previously completed projects). The first couple of semesters, I did not have deadlines for weekly components, and some students waited until the last minute to start on the project. Now with the deadlines and time lines, things run more smoothly. Next semester, I am sure I will make changes. When projects are completed, students complete a reflection sheet that helps me evaluate what went well and what did not.

The reaction of parents to this project is so positive.

Interdisciplinary Resources from AEL

Publications

Dissolving the Boundaries: Planning for Curriculum Integration in Middle and Secondary Schools is a unique professional development tool that can assist middle and high school faculties with decision making regarding curriculum integration, which is often a natural outgrowth of project-based learning. The book may also be helpful to school improvement councils, district committees, teacher education classes, or other groups that wish to learn more about curriculum integration. *Dissolving the Boundaries* is divided into three sections: (1) understanding curriculum integration, (2) assessing your readiness for curriculum integration, and (3) preparing teams for curriculum integration. It may be used effectively in a group setting. A *Facilitator's Guide* is available. Included are a time line for using the materials, step-by-step directions for an administrator or other group facilitator, interactive group activities, transparency masters, and participant handouts.

Curriculum Snapshots offers glimpses into the classrooms of real teachers at various stages of technology integration as they involve students in project-related activities. The snapshots are not intended to be ready-made lesson plans, but they do illustrate appropriate and creative uses of technology at many grade levels and within different subject areas. Contributing teachers name useful software, hardware, and supplementary content-related resources such as Web sites and videos. A glossary and information about educational software ratings are also included.

Summer Institutes

Project-based learning is one of the many instructional practices explored at Intrerdisciplinary Teamed Instruction (ITI) Institutes. Teams of teachers and administrators—as well as curriculum

specialists, staff developers, and teacher educators—can build their capacity for teamwork and curriculum design at a five-day ITI Institute. The days open with exciting, informative general sessions followed by team meetings during which teams process and apply new information. Each day includes presentations; team building; curriculum design activities; team sharing; networking; and time for individual reading and reflection, informal dialogue, and recreation. Teams leave the Institute with tools that help them weave standards, curriculum, instruction, and assessment into a relevant, rich tapestry of learning experiences. These tools include a plan for implementing interdisciplinary teamed instruction, a six-week curriculum map, and a team-developed integrated unit. AEL will supply a syllabus to those who wish to use an Institute for recertification or graduate credit.

Electronic Resources

Web Site

Additional ITI resources and how to put them to use in your classroom, including a searchable archive of ITI listserv digests, are available at http://www.ael.org/rel/iti.

Curriculum Mapping and Design Tool

Now available to individual schools and districts on a subscription basis, the program harnesses the power of the Web to make creation and alignment of curriculum, instruction, and assessment easier than ever. (Visit our Web site at http://www.ael.org/cmdt for more information.)

The Curriculum Mapping and Design Tool (CMDT) provides an on-line resource for creating and aligning lesson plans with state and district standards. Through its focus on mapping at the activity level, it encourages teachers to determine the objectives of activities as they are entered. The program can also connect assessments to activities and help to identify cross-disciplinary connections for instruction. Completed maps show at a glance what is taught, when and how it is taught, how it is assessed, and what standards are addressed.

Administrators become instructional collaborators as they review and provide feedback on teachers' work. The print feature eases preparation of district- and state-level reports. The program

- uses no special hardware; accessible from any Internet connection*
- updates automatically when standards change
- includes school, district, and individual activities, units, and curriculum maps/plans
- eases administrative review of curriculum and assessment
- links activities to state and district standards, and assessments to activities
- enables sharing and collaboration among teachers, curriculum supervisors, and administrators
- allows quick searches by subject, grade level, or standard
- protects original material while allowing for feedback, corrections, and changes
- bookmarks favorite activities for future reference
- publishes copies of activities, units, and yearly maps/plans

How it works. When a school or district subscribes to CMDT, AEL enters individual passwords for each staff member.** Once protected access is established, teachers and administrators will be able to create and change their own activities, units, and yearly lesson plans. They can also use, create variations on, and add comments to activities created by colleagues in the school, district, and state.

On-line support and an easy-to-understand interface help users to quickly find their way through the system.

Pricing. The one-time set-up fee and annual subscription costs are prorated according to school enrollment; purchase by a district brings a 20 percent discount on school set-up fees and free access for up to 10 central office staff members.

More Information

To find out more about any of the AEL resources described here, write, call, or visit AEL's Web site (see page ii for contact information).

*Client browsers must meet one of the following requirements:
- Microsoft Internet Explorer 4.01 or higher
- Netscape Navigator 4.08 or higher

**Clients must provide an authorized list of schools and user names.

Fifth graders design Web pages that feature the biographies of senior citizens they have interviewed. Eighth graders create science museum exhibits and invite the community to see them. High school students write skits and produce videotapes that illustrate the effects of immigration on science, history, and literature.

No, these students do not attend expensive private schools. Their teachers have tapped into the power of project-based learning.

Projects immerse students in interesting, real-world scenarios that connect personal interests and academic pursuits, usually within the context of life and work beyond school walls. Students involved in project work often learn to work with one another and with adults in the school and community. They learn to investigate a topic in depth and to communicate their findings to others. In the course of this work, they often discover hidden talents and develop new ones. Structured self-assessment and reflection enable them to evaluate and redirect their own efforts—an ability that will serve them well in future academic or employment settings.

Many teachers have found projects to be an effective and natural way to dissolve the boundaries between disciplines. This, in turn, can help students understand the relevance of various academic disciplines. For example, a student who is writing and producing a skit illustrating democracy in action must impose dramatic structures learned in English class on political knowledge gained in history class. The student also develops "work world know-how" as he or she motivates and directs actors and incorporates their suggestions for improving the final product.

Because projects frequently cross disciplinary boundaries, teachers involved in project-based learning may decide to team with teachers from other disciplines. To learn more about interdisciplinary teamed instruction, see this book's companion volume, *Dissolving the Boundaries: Planning for Curriculum Integration in Middle and Secondary Schools*.

A Teacher's Guide to Project-Based Learning introduces readers to the ideas and methods that underpin project-based learning. Teachers who are new to planning and managing projects will find it particularly helpful as a starting point and resource guide. Within these pages you will find profiles for 13 different types of projects, a step-by-step planning guide, an annotated list of essential references and resources, and project descriptions and comments from real teachers engaged in project-based learning.

Projects are powerful learning tools. Open this book to learn more about how to put them to use in your classroom. You and your students will be glad you did.

Douglas S. Fleming
consults with schools and districts in the areas of curriculum development, instructional practice, and learning assessment. He has co-authored several publications for AEL, including *Marginal Learners: Identification, Prevention, and Intervention* and *Focusing on Motivation: The Need to Succeed.*

A Teacher's Guide to Project-Based Learning demonstrates the power of student projects to develop school-community connections, applied research skills, and higher levels of student thinking. Fleming models the practice of inquiry-based teaching and learning in professional development workshops, institutes, and college-level courses throughout the United States.

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